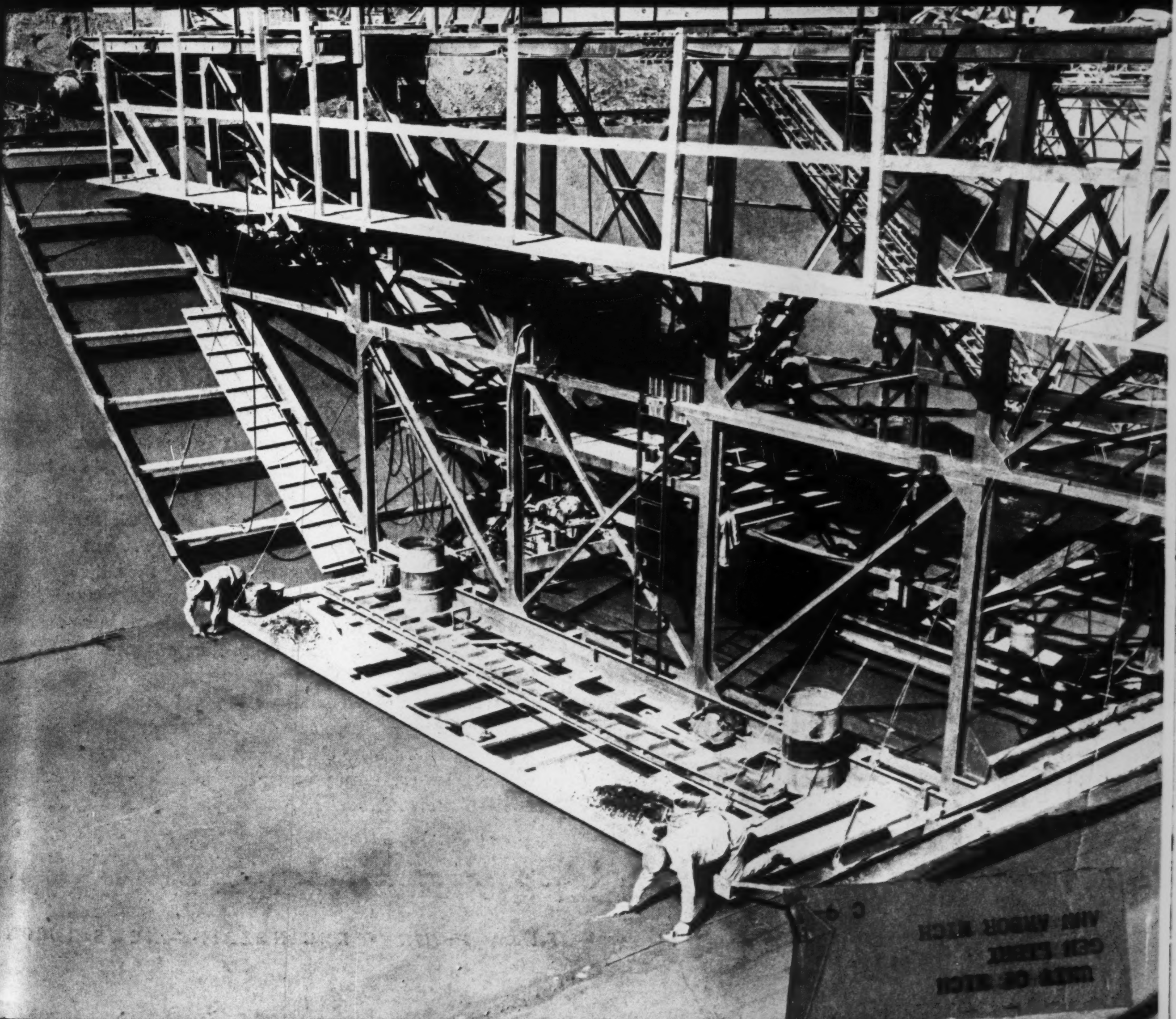
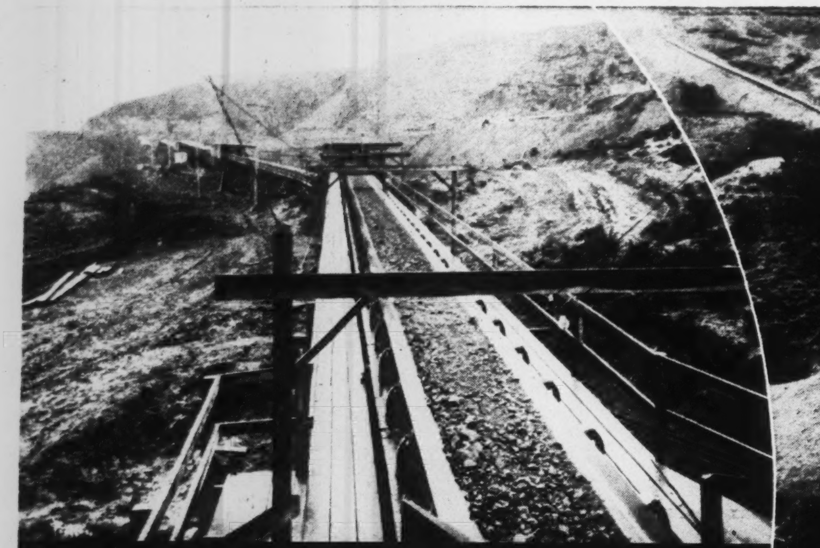
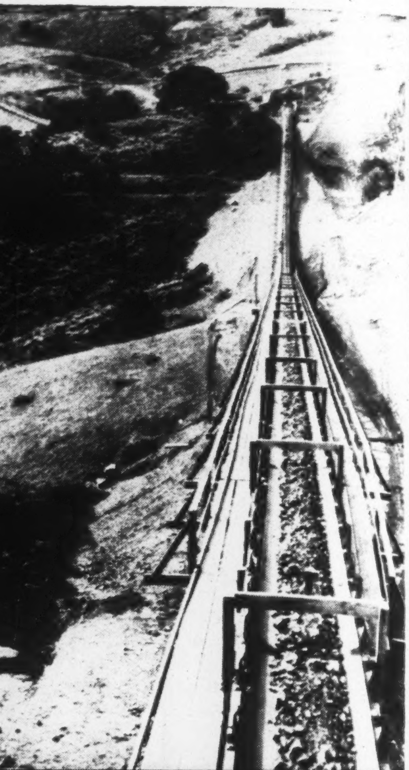
ENGINEERING
NEWS-RECORD
A McGRAW-HILL PUBLICATION

Jumbo rig used to cut expansion joints in Friant-Kern Canal lining





GRAND COULEE . . . 2 MILES



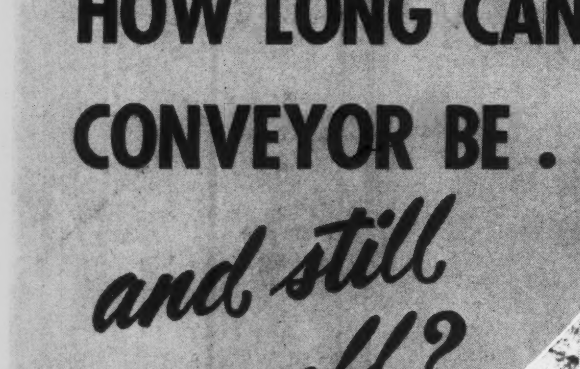
SAN JOSE . . . 4 MILES

HOW LONG CAN A CONVEYOR BE . . *and still pay off?*

On large construction projects, conveyors have long been the accepted tool for moving bulk materials in a continuous flow over short and medium distances . . . but how about relatively long hauls? Based on present data, 30 to 50 miles is probably the economic limit—one conveyor now under consideration would be 38 miles long, and there is every reason to believe that conveyor lengths may reach 50 miles in the near future.

Regardless of the length to which conveyors may grow, their electrification will not be a limiting factor. One-point electric control for the entire conveyor system is now possible, as well as electrical interlocking to prevent piling-up of material at flight junctions. On downhill runs, conveyor drive motors can function as generators and pump power back into the line . . . one conveyor system actually generated more power than it consumed, once it was placed in motion

Conveyors are just one of many electrified construction tools on which General Electric engineers are working in co-operation with equipment manufacturers and contractors to speed construction and keep initial, operating, and maintenance costs at a minimum. Ask your G-E representative how electrification of your construction equipment can help you make a better product at lower cost. *General Electric Company, Schenectady 5, N. Y.*



SHASTA . . . 10 MILES

GENERAL ELECTRIC

News of the Week

ENGINEERING NEWS-RECORD • FEBRUARY 27, 1947 • VOLUME 138 • NUMBER 9

Roadbuilders see boom year for highway construction

ARBA convention reflects prewar confidence—Airport construction spotlighted—J. T. Calloway, new president, sees biggest roadbuilding program for this year

If the energetic and enthusiastic cooperation evidenced throughout the multi-session, 5-day annual meeting of the American Road Builders' Association last week in Chicago is indicative of what lies ahead, the 1947 roadbuilding and airport construction programs should reach proportions comparable to the most optimistic wartime postwar estimates.

Apparently freed of most of the psychological and restrictive impediments that at times threatened to throttle this construction during 1946, the more than 2,000 engineers, governmental officials and Congressional leaders in attendance at the 44th annual meeting of the ARBA displayed a confidence reminiscent of prewar, boom-time years.

Congressmen stress highway needs

Congressional leaders who addressed convention sessions stressed the essentiality of a well-built, well-kept highway network to the nation's economic and social life and emphasized the need to improve the system rapidly to meet growing transportation demands. Mentioning the skyrocketing of highway use to 333 billion vehicle miles in 1941 and even higher today, Paul Cunningham, member of the House of Representatives public works committee and chairman of the subcommittee on roads, declared that "highway construction should not be speeded up or deferred at intervals, but must be carried on continuously to provide facilities for increased volumes of traffic." Our continuously depreciating highway plant, he pointed out, imposes a necessity to plan for a continuous rather than a sporadic program of construction and maintenance.

Admitting that road building should be confined to the most urgently needed projects until conditions in the labor and materials market become more stable, he warned that Congress, when considering future federal-aid legislation, will be guided by the results achieved with present authorization. Because of unfavorable conditions retarding construction in 1946, he said the House committee will carefully consider extension of the period during which federal-aid funds authorized by the Highway Act of 1944 (totaling $1½ billion in the first three postwar years) will be available for contract commitments.

After making a strong declaration for a reduction in the federal budget to $29 billion, H. Carl Andersen, member of the House appropriations committee, stated that he favored no cut in roadbuilding or other needed public works which benefit the national economy. Jesse P. Wolcott, chairman, House banking and currency committee, pointed to production as the only means of stopping further depreciation in the purchasing power of the dollar. Within 30 days, he predicted, Congress will give attention to legislation designed to reduce high construction costs, particularly of housing.

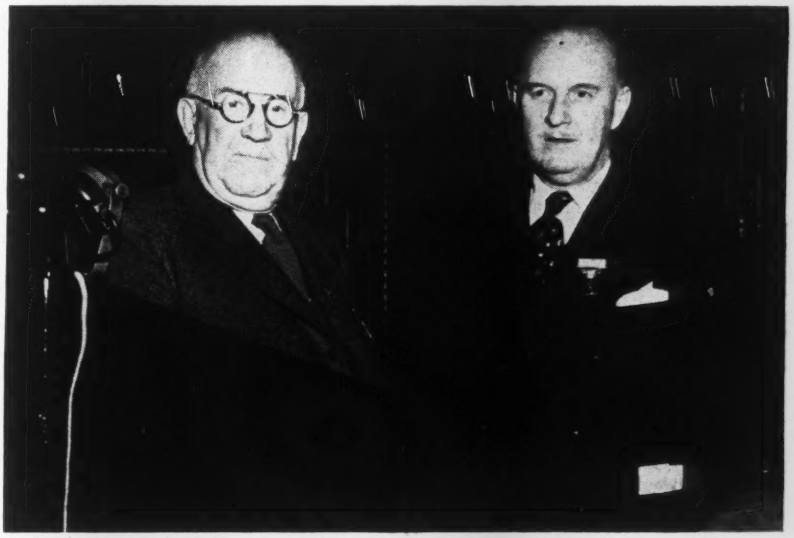
Federal-aid construction

Citing the all-time record of vehicle travel on rural roads and urban thoroughfares in 1946, Thomas H. MacDonald, commissioner, Public Roads Administration, urged all highway authorities to advance planned improvements to the construction stage as rapidly as prices, labor and materials make it possible to put the work under way. Stable prices are the prime requisite for an adequate construction program, he declared. The price index for the PRA composite mile rose at an accelerating rate during the four quarters of 1946, advancing from 119.3 in the first quarter to 133.3 in the fourth.

Regarding the outlook for materials, Mr. MacDonald forecast improvement in supplies of structural steel, cement and lumber for 1947, with sufficient cement in all parts of the country after the first quarter and enough lumber to take care of requirements later in the year.

During 1946, he said, 3.642 federal-aid projects amounting to $505 million were placed under contract, and bids were rejected for 976, totaling $141

(*Continued on page* 10)



***High Command**—James J. Skelly (left) retiring president of ARBA, and J. T. Callaway, incoming chief officer, confer at the rostrum*

NEWS IN BRIEF

In telegraphic form, here are late news developments on the engineering and construction front during the week.

Public construction—Plans are being prepared for a $1,000,000 administration building for the *Rochester, N. Y.,* airport . . . A $10,000,000 state medical school at Penn State College, *State College, Pa.,* is proposed in a bill introduced in the state legislature . . . The $900,000 Lamont library for undergraduates will be built this year at Harvard University, *Cambridge, Mass.* . . . Rutgers University, *New Brunswick, N. J.* will seek private funds, in addition to $9,000,000 requested from the state, for expansion purposes . . . Work has started on two new buildings at Oklahoma University at *Norman, Okla.* —press and research buildings.

Industrial construction — Hotel Adams, *Phoenix, Ariz.,* is adding 160 rooms by building four new floors. . . . A 7-story extension is planned for the Bell Telephone Co. building in *Montreal, Que.* . . . A $1,250,000, 10 or 12-story building for doctor's offices is planned in downtown *Baltimore, Md.* . . . C. Woodward, Ltd., department store at *Edmonton, Alta.,* have contracted for a $900,000 warehouse. . . . Reconstruction of the famous old St. Louis Hotel, at *New Orleans, La.,* at a cost of $5,000,000 is being planned.

Power plant construction—The Delaware Power and Light Co. and its system companies will undertake a $7,700,000 construction program this year. . . . More than $200,000,000 worth of expansion projects is under way by electric power companies in *Pennsylvania.* Among the projects are: Pennsylvania Power & Light Co., at the *Shamokin Dam* station, $115,000,000; Philadelphia Electric Co's $60,000,000 program at its *Barbadoes Island, Norristown,* and *Southwark, Philadelphia* plants; West Penn Power Co., $23,000,000 at its plants at *Courtney* and *Springdale,* Scranton Electric Co., will increase its generating capacity to the extent of $5,000,000, and the Luzerne County Gas and Electric Corp. will spend $3,740,000 for additional equipment for its Hunlock creek power station.

Highways—Tne Florida State Road department will receive bids March 27 for a 344-ft. bridge over Bayou Chico in *Escambia County.* . . . *Indiana's* highway program for 1947 includes $18,500,000 for 200 miles of roads and $8,000,000 for 62 bridges, and surfacing and widening 700 miles of road at a cost of $8,000,000. . . . The *Pennsylvania* State Highway Department will proceed at once to construct a new bridge over the Schuylkill River to replace the *Penrose Ferry* span. . . . . *Ohio's* road program includes $27,000,000 for construction and improvement of secondary roads during the next 3 years. . . . The *New Jersey* State Highway Departmen will spend $6,000,000 for road pavin in the various counties. . . . Baile bridges are now being offered for sal by the War Assets Administration information is obtainable at WA offices in *New York, N. Y., Cleveland Ohio* and *Spokane, Wash.* . . . *Florid* awarded an $836,000 contract for con struction of the first section of its Miam —Jacksonville superhighway.

Housing—A $2,000,000 developmen at *Burlington, N. J.,* has been authorize . . . A $1,000,000 housing project fo faculty members of Kansas State Co lege is being planned at *Manhatta Kan.* . . . Seven hundred new dwellin units are planned for *Vancouver, B. C*

Bridge, road proposals concern states

With the approach of the 1947 construction season, states are calling f highway action on many fronts. Among devolpments last week were:

A proposal has been made in the New Hampshire Legislature for the construction of a "super" toll road from the Massachusetts border up through the White Mountains. A 5-man commission with a $50,000 budget, has been suggested to study the advisability of creating the authority for one or more toll roads in the state.

A bill has been introduced also which would create a New Hampshire Turnpike Authority to construct and maintain a through highway from Seabrook to Portsmouth. The 19-mile strip costing $6,000,000, would connect with a Maine superhighway now being constructed from Kittery to Portland.

New Jersey bridge approach

Construction of the Harrison approach to the Stickel Memorial Bridge crossing to Newark on Route 25A will be performed under bids to be received by N. J. State Highway Commissioner Spencer Miller, Jr., March 4.

This quarter-mile link will extend from Passaic Avenue in East Newark, adjacent to the Passaic River, to Harrison Avenue, in Harrison. On Feb. 24, the commissioner will take bids for the ramps on the Newark side to connect Route 21, the McCarter Highway. The piers for the bridge have been completed under the $412,218 contract of Senior & Palmer, New York, and the steel to span the river is being assembled under the $1,532,454 co tract previously awarded to the Mou Vernon Bridge Co.

When all this work is complete traffic will have a continuous new road way from Harrison Avenue, Harriso to McCarter Highway, Route 21, Newark.

Kennebec River toll bridge

Legislation seeking a toll bridge ove the Kennebec River in Augusta, Me where five major highway routes for a bottleneck in the heart of the bus ness section, has been filed in the Main Legislature by Senator Burton M. Cros of Augusta.

"I think the situation has reache a point where the traveling publi would rather pay a small toll tha wait in line for the Augusta crossing Cross declared.

THE COVER PICTURE

For cutting expansion joints on the Friant-Kern Canal, part of the Central Valley, Calif., project, a special jumbo was used. Riding on the ends of a platform, two men cut the longitudinal joints at the base of the side slopes. In the interior of the jumbo are two devices for making the transverse joints.

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High construction costs force change in Arizona water project proposals

Bureau of Reclamation recommendation advises shifting from Bridge Canyon route to pumping plan to eliminate 78-mi. tunnel and some canal construction

The rapid rise in construction costs, upled with the desire to remedy growg water shortages in Arizona as ickly as possible resulted last week a Bureau of Reclamation recomendation that the proposed Bridge nyon project be abandoned in favor the Parker pumping plan.

The Bridge Canyon Project (*ENR* ly 4, 1946, vol. p. 6) called for a gh dam on the Colorado River bew the Grand Canyon and 78½ mi. tunnel and 235 mi. of canal to bring ater of the Colorado into the Salt iver near Phoenix.

E. A. Moritz, director of Region III r the bureau, said his organization had pproved both the Bridge Canyon and arker plans as to feasibility, but ointed out that present construction sts would place the Bridge Canyon ute at $1,011,000,000—nearly twice hat it would have cost at the time oulder Dam was built.

Construction cost of the Parker plan, e estimated, will be $605,000,000 at resent rates. Annual cost of operating e system, Mr. Moritz added, would e $5,131,000, and it would be necesry to set aside $1,986,000 yearly for eplacement of worn-out pumps and enerating equipment. This annual cost ould exceed by $462,000 yearly the peration cost of the Bridge Canyon avity route.

Under this plan, some 30 miles of nal and the long tunnel needed for e Bridge Canyon job will be eliminted. Pumps would be installed at the arker Dam site to lift 1,200,000 acre-. of water out of the reservoir formed y that dam into a canal system running oughly southeastward to serve central rizona.

The new recommendation was imediately endorsed by Governor Osborn.

Shortages threaten

An immediate result of the shift in lans, Mr. Moritz said, would be that e water could be delivered to Arizona sers within about five years, instead of 0 years if the Bridge Canyon project as to be built at this time. He added, owever, that the latter project could e built at any time, since the newer lan could be integrated with Bridge anyon.

Urgency of the project was stressed n the bureau report, which quoted the groundwater division of the U. S. Geological Survey's recent reports showing that the current rate of pumping from underground storage is more than twice the normal recharge of such storage. "Unless some new source of water can be developed, a serious and permanent impairment of the area's agriculture induced by water shortages, will result," the survey report said.

◆

Labor bureau to issue productivity studies

A series of industrial productivity studies, including one one industries producing construction machinery, will be issued soon by the U. S. Bureau of Labor Statistics.

These studies will report man-hours per unit of production for the years 1939-1945.

They are the first in which BLS has gone directly to the plants for its data, rather than relying, as in the past, on a comparison of production and employment data supplied by the Census Bureau and BLS, respectively.

International research on hydraulic structures

After being virtually dormant for more than 6 years because of the war, the International Association for Hydraulic Structures Research has been reactivated and plans have been made to hold its first postwar meeting in Stockholm, Sweden, in June, 1948. The president of the organization is Wolmar Fellenius, professor emeritus at the Technical University of Stockholm, who for several months has been in communication with members of the international permanent committee. The secretary is J. Th. Thysse, professor and director of the hydraulics laboratory at the Technical University of Delft, Holland.

The meeting of the association will precede a meeting of the "Congress des Grands Barrages" also to be held in Stockholm at that time. (*ENR* Feb. 13, vol. p. 239) Arrangements are in progress for excursions in Sweden to various dams and hydraulic works following the meetings.

Applications for membership in the association are being accepted. The American member of the permanent committee is Lorenz G. Straub, director of the St. Anthony Falls Hydraulic Laboratory, University of Minnesota. Persons wishing to become members of the association may communicate with him at the laboratory in Minneapolis, Minn.

Seek codes for Canadian welding work

A Canadian Welding Bureau has been set up as a division of the Canadian Standards Association, to ensure good welding by approving shops, engineering and supervisory personnel.

The basis of approval will be qualification under the codes and specifications prepared by the association. Progressively the C.S.A. will prepare codes covering the whole welding field and it is hoped that the confusion of a multiplicity of codes which has developed in other parts of the world will be avoided.

Bureau approval will be granted only to those fabricators whose welding equipment, operators, supervisors and engineering personnel satisfy the bureau's standards. A list of such approved fabricators is now being prepared and will be made available to municipalities, government departments, consulting engineers and others.

R. M. Gooderham, general manager of the bureau, is a graduate in engineering of the University of Toronto, and has had over twenty years experience in the welding field, having joined the staff of the Lincoln Electric Co. of Canada Ltd., immediately upon graduation. He later organized the British and European divisions of the Lincoln group. During the war he became welding advisor to the British Ministry of Supply and assisted in the formation of its advisory welding service. He toured the U.S.A. in 1941 to report to the British Government on American welding methods, following which he returned to Canada and became welding advisor to the shipbuilding branch of the Canadian Department of Munitions and Supply.

Mr. Gooderham will be assisted by W. Ralph Stickney, another engineering graduate of the University of Toronto, who has been engaged since graduation in 1936 on welding work with the Canadian Bridge Co. and more recently with Canadian Vickers Limited.

Temporary offices of the bureau are at 86 Bloor Street West, Toronto, Ont.

DEVELOPMENTS BEYOND U. S. BORDERS

Digested from reports by Engineering News-Record correspondents and the McGraw-Hill World News Bureau

Britain, Australia, Philippines plan airfield work—Mexico to spend $32 million in 1947 on road and railroad construction program—Russia pushes work on hydro-power developments—Politics delays final closure of Yellow River dike in China

England—The British Ministry of Civil Aviation has started detailed examination of plans for a marine air terminal at Cliffe, on the south bank of the Thames Estuary, between Gravesend and Rochester.

An earlier plan for establishment of the terminal at Langstone Harbor, Portsmouth, was abandoned following objections from the Navy on the ground of proximity to the Portsmouth naval shipyards.

Sponsored by the Port of London Authority, the Cliffe plan calls for construction of a non-tidal salt-water lagoon as a base for seaplanes, with an adjacent land plane base. Cliffle is 26 miles from London Bridge and can be reached by highway or by train in less than an hour from the center of London.

The site is now used as grazing land.

Australia — The Treasury has approved expenditure of nearly $20,000,000 on civil airport development throughout Australia.

Main projects covered by the appropriation include: Construction of a new international airfield for Sydney, at suburban Mascot; completion of the second stage of the Essenden (Melbourne) airport expansion, including two concrete runways, taxiways, aprons, circumferential road and roads and services; first stage of development of an airport for Adelaide, including preparation of the site and construction of three runways; development of a second airport for Melbourne to accommodate light aircraft; construction of an airport at Devonport, in Tasmania and construction of additional runways at Kalgoorlie and Guildford (Perth) airports in western Australia.

Philippine Republic—Plans of the government to make Manilla the air hub of the Orient include the rebuilding of old Nielson Field into a deluxe international air terminal. About $7,500,000 will be spent improving the runways and hangars, building a hotel, swimming pool and other facilities.

Runways that are now 7,000 ft. long will be extended to 10,000 ft.

Built originally as a U. S. Army Base, Nielson field was used by the Japanese, retaken by U. S. forces and finally turned over to the Philippine Air Force—who in turn relinquished operation to the Philippine Air Lines.

Highways, Railroads . . . .

Mexico—A 6-year highway and railroad construction program, designed to fill in the main gaps in Mexico's existing transport network, has been adopted by President Miguel Aleman's administration. The program contemplates the expenditure of more than $32,000,000 in 1947 alone.

In the highway program, top priority is given to the completion of the Inter-American Highway between Oaxaca and the Guatelamlan border. Appropriations for this work represent a large percentage of the total amount set aside for highway construction.

Next in importance is construction of the Mexico City-Ciudad Juarez highway—known as the Central Highway—t connect the central states to the northern ones and to west Texas at El Paso. The road is expected to be economically important for truck-transport of early vegetables and livestock destined for the U. S. and Mexican markets.

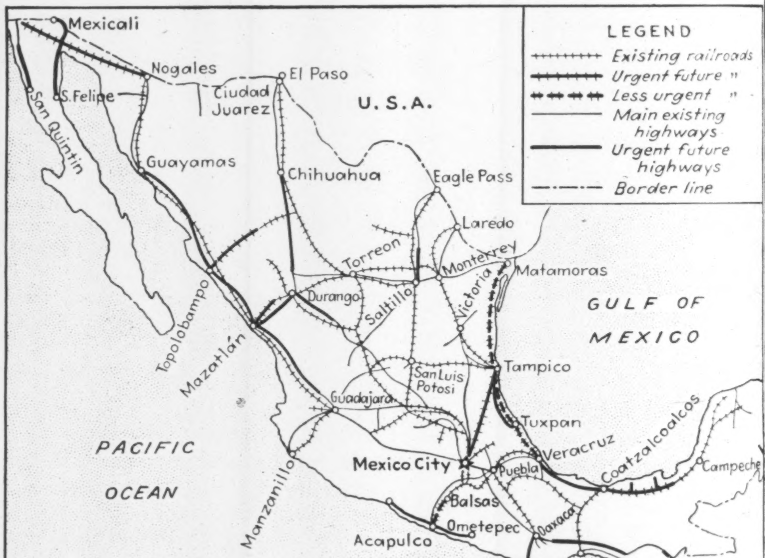
Other highway work will include: The Mexico City-Nogales (Ariz.) Pacific Coast Highway; roads between Tiajuana and San Quentin and Mexicali and Sa Felipe in Lower California; and number of roads in the southeastern part of the country to provide highway access to the towns of Uxmal, Valladolid, Puerto Juarez, and others.

Railroad work extensive

If, as is expected, sufficient low interest loans can be obtained from the U. S. Export-Import Bank or the Bank for International Development, Mexico will build many new railroad lines. These include:

Completion of the Chihuahua-Pacific which is to join El Paso, Texas t Topolobampo on the Pacific coast; short line from Mexico City to Tampico; a line between Durango and Mazatlan.

Major projects, in addition to those


LEGEND
Existing railroads
Urgent future "
Less urgent "
Main existing highways
Urgent future highways
Border line
Mexicali
Nogales
El Paso
Ciudad Juarez
U. S. A.
S. Felipe
San Quintin
Guayamas
Chihuahua
Eagle Pass
Laredo
Torreon
Monterrey
Matamoras
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Mazatlán
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Tampico
Guadajara
Tuxpan
Coatzalcoalcos
PACIFIC OCEAN
Veracruz
Campeche
Manzanillo
Mexico City
Puebla
Balsas
Ometepec
Oaxaca
Acapulco
Puerta Angel
Salina Cruz
GUATEMALA

***Mexican Transport Plans**—To close the many existing gaps in Mexico's highway and rail transport systems, the government recently announced a six-year construction program. The heavy lines showing needed construction emphasize the lack of cohesion now present in the rail-highway system.*

entioned above, will include comple-
n of the 700-mi. South Eastern Rail-
y—already in exploration—connect-
 central Mexico to Yucatan to end
t state's present isolation (except by
 and air) from the rest of the coun-
, and construction of the Sonora-
wer California Railroad to remedy a
uation which has made Lower Cali-
nia accessible by rail only through
e United States.

A longer-range project is construction
a line along the Gulf coast, but at
st observers believe this line can
ly be started in the next six years.

Another project is the widening to
ndard gage of the narrow-gage "Fer-
carril Interoceanico" across the Isth-
us of Tehauntepec.

France—Construction has started on
e electrification of the Paris-Lyon
ailway. Scheduled for completion by
e end of 1950, the project will enable
auling of heavier trains, and will
orten scheduled running time between
e two cities.

Power is to be supplied from the new
enissiat Dam (*ENR* Feb. 13, vol. p.
5) now under construction. Electri-
cation will save the use of more than
00,000 tons of coal a year, railway
ficials said.

ower ....

Russia—Pushing ahead to re-establish
 war-devastated power production po-
ntial, Russia is rushing work on its
ammoth Greater Volga development,
e restoration of the Dnieper Dam in
e south Ukraine, and has announced
art of work on another huge project
 the Republic of Kirghizian, where
e Chu River is to be made to produce
wer and irrigation water.

At the Dnieper Dam, the International
eneral Electric Co. said last week that
e first of three 90,000 kva. generators
stalled has been operated successfully,
 full speed. The unit was driven by
0,000-hp. turbines manufactured by
e Newport News Shipbuilding and
ry Dock Co. Original generators were
estroyed in 1941 to prevent their use
 the Germans.

Work on the Greater Volga program,
hich calls for construction of a series
 dams and hydroelectric stations on
urope's biggest river and its tribu-
ries, has been resumed after the war's
terruption. The project calls for the
onversion of the Volga into a major
aterway linking the rivers and seas of
uropean Russia into a single system,
pping vast water power resources
nd irrigating large areas.

All told, eight large power stations are to be built on the Volga, and seven on its tributaries—the Oka and Kama.

The Volga itself is 3,700 kilometers long, has some 132 tributaries, and before the war, the river and its tributaries handled nearly half of all the tonnage carried on the country's internal waterways.

The Kirghizian project will include construction of a dam (already under way) on the Chu River, located in a canyon, near Tezekbayeva.

Rivers ....

China—Political differences are delaying the final closure of the Yellow River dike break near Huayuankow, in Honan (*ENR* Oct. 31, 1946, vol. p. 572). Disputes between the Communists and the Chinese National Relief and Rehabilitation Administration over non-distribution of $15,000,000,000 (Chinese currency) of relief supplies and rehabilitation funds for an estimated 300,000 persons who settled in the old river bed but must now be dispossessed—mostly in Communist "liberated" areas—has been raging for months.

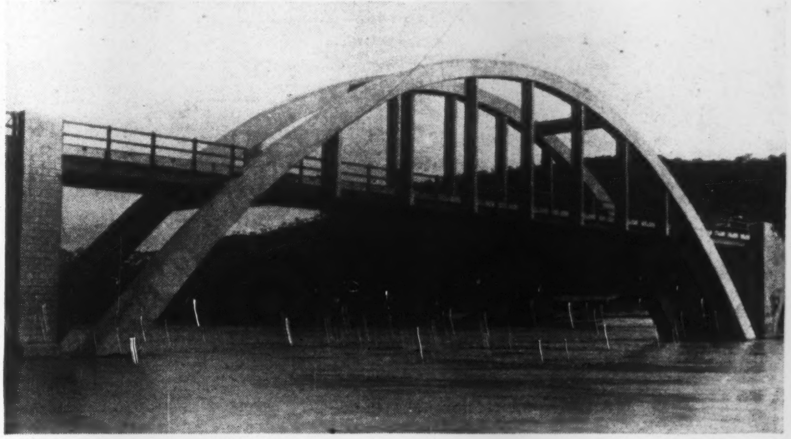
Although the initial agreement was reached late in July, the Chinese government and CNRRA have not carried out the specified final obligations. Only recently has one-third of the funds been appropriated by the government. Now, the processes of distribution is being worked out.

As to the project itself, the engineering problems have been definitely beaten, observers say, and the remaining gap in the dikes can be closed at any time.

Miscellany ....

Mexico—The recent adoption of a vast program of irrigation and drainage during the six year period 1946-52 has increased in already acute shortage of skilled technicians and engineers. To remedy the situation, the National University of Mexico and the newly-organized Ministry of Hydraulic Resources have signed an agreement for the speedy training or irrigation specialists—providing for an uninterrupted three-year school program (with two weeks between periods).

England—More houses were completed in Britain in December than in any previous month of 1946, according to latest government reports. The report said that during 1946, more than 150,000 houses were completed in England, Wales and Scotland—of which over three-fifths were temporary. In December, 22,000 houses were finished.



Indian Bridge—*A new bridge over the Mond River in Udaipur State, India, the 175-ft. reinforced concrete main arch span presents both architectural and structural interest by virtue of its floor hangers and sway bracing system. The concrete hangers are cast integrally with the floor beams to form inverted rigid frames. To prevent cracking, the hanger concrete was deposited around the reinforcement after the latter was brought up to the full dead load stresses by preloading the deck. The frames provide considerable lateral resistance to wind and are supplemented by two cross struts between arch ribs, which constitute the entire lateral sway bracing system. A 50 lb. per sq. ft. wind load was assumed. Design stresses were 950 lb. psi. in the concrete and 18,000 psi. in the steel. Four barrel arches on one side and one on the other constitute the approach structure, making the entire bridge 501 ft. long. J. C. Gammon Ltd., Bombay, designed and built the bridge.*

Congress considers more than 50 bills affecting engineering, construction

Measures before two houses range from housing and major appropriations bills to regulation of internal affairs of government's construction agencies and creation of science foundation

While the spotlight of political attention has centered on Congressional action on the federal budget and labor matters, a flood of bills affecting engineering and construction has already been placed before the national legislature.

The measures range from the Celler Bill (H. R. 45)—an overall housing measure closely paralleling the Wagner-Ellender-Taft Bill, that would make the National Housing Agency a permanent federal organization and appropriate $25,000,000 over a five-year period for planning—to a measure (H. R. 1886) transferring from the Secretary of the Interior to Congress the authority to authorize reclamation projects.

How many of these measures will reach the voting stage, and how many will die in committee is problematical. Hearings have already started on many of them, and many more are expected to be introduced shortly.

Among the more important bills now in the Congressional hopper are:

For housing, in addition to the Celler Bill mentioned above, four less important measures have been introduced. Two of these, H. R. 314 and H. R. 681, amend the housing act of Oct., 1940, to simplify the disposal of war housing. H. R. 285 would increase the President's powers over housing, and H. R. 60 would make available to every veteran a $4,000 loan for payment on or construction of a dwelling.

Labor bills introduced—in addition to the widely-publicized Case Bill (H. R. 725), the Ball-Taft-Smith bill (S. 55), and a third measure (S. 105) which would outlaw the closed shop—include two improving the position of professional men under the Wagner Act. Each of these proposals (S. 360 and H. R. 1754) adds definitions of the term "professional employee" which are substantially identical. Fuller details of these bills were given in *ENR* Feb. 13, vol. p. 241.

Pollution abatement

At least six bills pertaining to the problem of abatement of stream pollution have been introduced.

Four of these, S. 418, H. R. 123, H. R. 315 and H. R. 470 are similar, in that they place water pollution control activities in the United States in the hands of the U. S. Public Health Service and set up machinery for this agency to carry out an extensive survey and study of the problem. They also propose that the Federal Security Administration—of which USPHS is a part—be empowered to extend federal aid up to $100,000,000 yearly to state and local governmental groups to carry out abatement work, plus $1,500,000 yearly for studies and planning.

The other two bills, S. 244 and H. R. 1047, would encourage prevention of stream pollution by allowing expenditures for the construction of treatment plants for industrial wastes to be deducted in computing net income.

Reclamation, flood control

Two identical House bills, H. R. 655 and 656, would exempt the Central Valley Project in California from the land-ownership limitations of federal reclamation laws, and a Senate measure (S. 21) would authorize the Committee on Public Lands to make a comprehensive study of contracts offered by the Department of Interior for the disposition of water resources of the Central Valley Project.

S. 433, H. R. 1598 and H. R. 1616—similar bills—approve construction of the Bridge Canyon project for regulation of the flow of the Colorado River and bringing its waters to Arizona (*ENR* May 24, 1945, vol. p. 742, and page 3 this issue). Importance of these bills is limited because the Colorado Basin states must agree among themselves as to apportionment of Colorado River water before any project can be constructed.

Other bills up for consideration include: H. R. 13, approving the U. S.-Canada agreement for the Great Lakes-St. Lawrence Waterway; H. R. 608, calling for construction of flood-control and navigation improvements in the basins of the Arkansas and White rivers; and H. R. 1570 which sets up a Merrimac Valley Authority for New England.

Highway work

Most important of the proposals pertaining to highway work is H. R. 1874, which would amend the Federal-Aid Highway Act of 1944 so that the $500,000,000 of federal money available each year for the first three postwar years would continue to be available for two years after each specific year. As the law is now written, the money can only be carried over for one year.

H. R. 1063 calls for the construction of several superhighways across the country, and H. R. 9 would authorize use of federal funds to acquire forest lands along highways. Other highway measures include:

- H. R. 935, providing $150,000 to continue surveys for the Natchez Trace

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N. C. municipalities seek state funds for streets

A bill to liberalize the use of state funds allotted to municipalities for maintenance of state highways and county road connecting links running through cities and towns was introduced in the North Carolina legislature recently.

The state now appropriates $1,000,000 a year for maintenance of state highways and county road connecting links within cities and town, allocated on the basis of population and the number of miles of such highways and roads within a municipality, but the money cannot be used for maintenance of municipal streets.

The new bill would permit local governing bodies to use state-appropriated funds for maintenance of city streets, provided there is any amount of the appropriation left after highways and county road connecting links have been maintained to the satisfaction of the state commission.

Federal housing work to be coordinated

Extended coordination of housing activities of federal agencies, including the National Housing Agency, its constituents and other agencies that have an active interest in housing matters was announced recently.

Administrator Raymond M. Foley said an NHA Coordinating Council had been established, to include representatives of the Department of Agriculture, the Veterans Administration, the Reconstruction Finance Corporation, the Federal Deposit Insurance Corporation, and the Office of the Housing Expediter, in addition to the three agencies made part of NHA by executive order in 1942, the Federal Housing Administration, the Federal Public Housing Authority and the Federal Home Loan Bank System.

Such questions as reconciliation of varying techniques in residential appraisal and model building codes will be considered.

Parkway in Louisiana and Texas; H. R. 9, reviving the St. Lawrence Bridge Commission and authorizing it to build bridge near Ogdensburg, N. Y.; H. R. 710, providing $250,000 for surveying the proposed Mississippi River Parkway, and H. R. 155, which amends federal highway laws to make available federal funds for construction and maintenance of publicity owned toll bridges.

Science measures

Creation of a national science foundation is provided in six bills. Four of these— S. 526, H. R. 1815, H. R. 1830 and H. R. 1834—are identical, calling for an independent agency with 48 members. All inventions produced by employees of the foundation would be made available to the public.

The other two science bills—S. 525 and H. R. 942—call for a 9-man national science board, appointed by the President.

Other proposals

Many other bills introduced call for appropriation of large sums for construction. These range from S. 134, which authorizes $30,000,000 for construction and operation of plants to produce synthetic liquid fuels from oil shales, to money and authority for construction of several hundred miles of fence along the U. S.-Mexico border. Included also are measures (S. 552, S. 586 and H. R. 115) to permit construction of a $10,000,000 naval academy on the Pacific Coast; S. 450 approving a $10,300,000 U. S. Court of Appeals building at Washington, D. C., and S. 230 authorizing the Navy to build $12,000,000 worth of aviation facilities at Annapolis, Md.

One proposal before the House (H. R. 891) would empower the Secretary of Commerce to establish standards for the construction of hotels, and set up machinery for the Commerce department to issue certificates of compliance with standards set.

A HELP TO "PRAMS"

Construction of ramps on sidewalks in a residential area of Toronto, Ont., has been approved by the city council, as an aid to women.

The novel idea is to have gentle slopes from sidewalks to street level in order to assist mothers pushing baby carriages and pesons in wheelchairs. The ramps will not constitute a hazard—one half inch to the foot with a 12-foot long slope is adequate insurance that the slopes will not cause any accidents, for which the city might be liable.

Unions attack Arizona anti closed shop law

Contest constitutionality of new state law in suit filed at Phoenix—New York builders negotiate wage dispute.

Arizona courts last week were the scene of opening rounds of a concerted union attack on the anti closed-shop laws now in effect in several states, after legal representatives of the American Federation of Labor filed suits in Superior Court at Phoenix that will test constitutionality of the recently-passed state statute.

The law was approved at elections last November and when building contractors in the state told labor representatives they would sign no more closed shop agreements (*ENR* Nov. 28, 1946, vol. p. 702) it was indicated that the national AFL organization would contest the law. The measure—which is in the form of an amendment to the state constitution, specifies that "no person shall be denied the opportunity to obtain or retain employment because of non-membership in a labor organization", and makes it illegal for any employer to enter an agreement requiring union membership or "closed shop".

Similar statutes are in effect in Nebraska and South Dakota.

Joseph A. Padway, AFL general counsel, filed the suit on behalf of the national organization and numerous local affiliates, including most of the building trades unions in the state. Defendants named are the American Sash and Door Co., several private individuals and John L. Sullivan, Arizona Attorney-General.

Issues, according to Padways' complaint, are the construction and validity of the amendment and constitutional rights of the plaintiffs. The AFL alleged, among other things, that no labor organization in Arizona controls a monopoly—by reason of any closed-shop, union shop or union-security agreement—over the supply of labor in the state or any of its communities. It contended that enabling legislation is necessary before provisions of the amendment become operative.

New York Strike settled

A 35-hour strike of metal lathers which had threatened a complete tie-up of New York City construction projects was ended last week after representatives of Local 46, Metallic Lathers Union (AFL) and employers agreed to mediation of their dispute. Although none of the union demands were granted in the agreement, the lathers returned to work pending outcome of negotiations for a 7-hour work day.

The men struck when they were refused in their demand to retain a seven-hour day, and at the same time receive a 40-cents-per-hour wage increase, despite the recent signing of a master agreement between New York City unions and contractors (*ENR* Jan. 16, vol. p. 89) which provides for an eight-hour day. The lathers were not a party to that agreement.

COUNTRY-ROAD SIDEWALKS

Construction of sidewalks along rural highways where pedestrian traffic is heavy is one of the several recommendations made by Kentucky's engineering subcommittee on highway safety.

The report, offered by Chief Highway Engineer T. H. Cutler, chairman of the engineering group, points out that such a plan would eliminate the cause of many accidents.

Propose $10 million dam for Idaho Power Co.

A $10,000,000 hydroelectric dam and plant will be constructed by the Idaho Power Co. of Boise, on the Snake River in Eastern Oregon, if the Oregon legislature amends its private power company licensing act, C. J. Strike, president of the company, has announced.

Strike said the Oregon act "discouraged investments in power plants because it does not conform to the federal licensing act and because it permits the state to take over any such plant upon two years' notice."

If Oregon does not change the act, the company may build a dam and plant in western Idaho to serve the western end of the company's system, which reaches into Eastern Oregon. Indications are that the state legislature will make the requested changes.

New Montreal bridge construction to start

Intended to speed up traffic between Montreal, Que., and the Lachute district, construction of the new $1,500,000 St. Eustache bridge to replace the old de Bellefeuille span over the River of the Thousand Isles will get under way this spring, it has been announced by the Provincial Public Works Department offices.

Engineers are now working on plans for the bridge and everything is expected to be in readiness as soon as weather conditions permit.

HIGHLIGHTS OF MUNICIPAL DEVELOPMENTS

Summarizing current activities in city engineering and construction throughout the country.

Kansas City plans $14.5 million school building bond vote—Cleveland wins court test of right to develop lakefront parkway—Sewage disposal concerns many municipalities—Oklahoma City considers underground parking lots—Other city engineering news

Considering one of its largest school building and reconstruction programs, the Kansas City, Mo., Board of Education recently voted to submit a $14,500,000 bond issue proposal to the Citizens' Bond Committee, for inclusion on the ballot in a joint city-county bond election scheduled for April.

H. C. Hunt, superintendent of schools, said the goal of the program includes installation of fireproofing and proper lighting equipment in every school, modernization of the better buildings in the system, and razing and replacing buildings no longer considered adequate.

Included is a $750,000 central football stadium and fieldhouse, a $1,252,000 high school and athletic field, and a $575,000 program for better illumination. Other new buildings planned are a new school for Negro children and a new warehouse for the board's repair department. In addition, many of the existing structures will be enlarged.

◆

Prepare Sewerage Plans

Problems of collection and proper disposal of sewage concerned three cities during the last week. At Birmingham, Ala., a $15,000 contract was awarded to the firm of Alvord, Burdick and Howson, of Chicago, for a complete survey of the city's problem. The award was seen as the first step in a long-range plan expected to culminate in a $10,000,000 to $15,000,000 construction program.

At Seattle, Wash., the firm of Parker and Hill was instructed to proceed with preparation of plans for a $1,250,000 sewer system in the suburban area north of the city—a project involving 36 miles of pipe and a sewage disposal plant.

Atlanta, Ga., awarded a contract to Weidman and Singleton, consulting engineers, for preparation of plans for installation of a sewer system in suburban Dalton, recently incorporated into the city, and for increasing the capacity of the existing system.

◆

Richmond Adopts Landfills

Adoption of the landfill method of refuse disposal and the elimination of separate collections of garbage and rubbish in Richmond, Va., are expected to result in a 20 percent saving in time and manpower, according to Robert S. Hobson, head of the city's Bureau of Refuse Collection. Last week, the city abandoned open-dump disposal methods, and householders were advised that all refuse could be put in a single can.

Landfill operations will be conducted with "bullclam" shovels attached to tractors—the practice being similar to that developed by the Army at a number of its smaller camps.

◆

Parking Plans Aired

Legislation that would permit Oklahoma City, Okla., to issue revenue bonds to finance construction of an underground parking lot in the civic center is to be introduced in the state legislature soon, the city's Parking Commission said recently.

Under terms of the legislation, the city would be enabled to issue revenue bonds for construction of a surface, elevated, or sub-surface parking station, the bonds to be secured by revenues from the station.

Construction of the sub-surface station is expected to restore the center to park use and eliminate private car parking which has forced store-owners whose property faces the center to encroach on curbs for truck-loading operations.

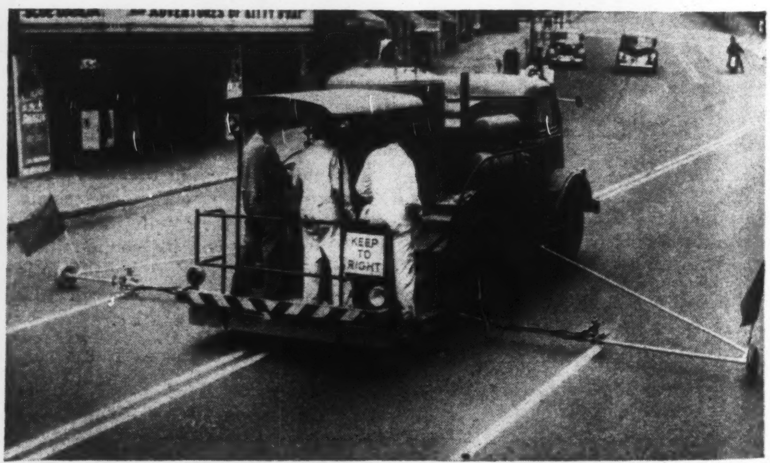
While Oklahoma City considered sub-surface parking, officials of Indianapolis, Ind., said plans are being rushed for erection of four $1,500,000 concrete, open-type, 2-story structures in the downtown area, with provisions for additional floors if necessary.

◆

Study Water Main Sealing

Findings to date in a long-range study of a sulphur compound used to seal water-main joints since 1929 at Milwaukee, Wis., indicate that no extensive replacement will be needed, according to J. P. Schwada, city engineer.

The investigation began last fall when some tests of joints in use revealed disintegration. Analyses have shown, however, that the sulphur sealing compound is standing up well and requires less attention than the type of joint formerly in use, Mr. Schwada said. After the initial tests, use of the sulphur compound was discontinued, but in the light of subsequent findings, the discontinuance order was rescinded.



Acme Newspictures

Road Striper—*Designed and built by Carl Sohmer of Tacoma, Wash., this new traffic-line striper is one of many new types now being used in U. S. cities (ENR Feb. 6, vol. p. 208). Operated by three men, the machine uses about 80 gallons of paint to line about 12 blocks, moving at a speed of a block a minute. The machine averages about 25 miles per day.*

Roadbuilders stress adequate system

(Continued from page 1)

million. Referring to contractors active on federal-aid highway construction, Mr. MacDonald reported that the number decreased to 3,057 during the period 1940-46, from 5,614 performing such work in 1935-39, but that some 350 new contractors were added during 1946. With a renewed warning against the delay of highway construction caused by antiquated procedure for purchasing right-of-way, he made a strong plea for revision of state laws to permit speedy acquisition of land.

Public support for highways

Discussing the state's part in expediting the highway program, C. W. Phillips, president, American Association of State Highway Officials, emphasized the need of educating the people to a realization that the "highway plant" is a public necessity. His prescription coincides closely with the planned program of the ARBA public relations division, as reported to the convention.

Mr. Phillips asked for encouragement of initiative through assignment of more discretionary power to state highway departments and to engineer employees of those departments in applying and modifying standards adopted at higher levels. The same sort of discretionary authority was suggested by some of those attending the meetings of county highway officials and of local highway administrators, although many expressed complete satisfaction with PRA standards for secondary roads and with the procedure for applying the standards.

Highway safety

Speaking on engineering for highway safety, Maj. Gen. Philip B. Fleming, administrator of the Federal Works Agency and of the Office of Temporary Controls, stated that traffic lanes generally need to be wider than 10 ft. and that three-lane highways are death traps. He emphasized anew the need for ample sight distances, elimination or adequate protection of highway-railway grade crossings, provision of separate pedestrian facilities along highways, maintenance of roadways for safe year-round travel, and adoption of uniform traffic signs, signals, markings and islands for all states and communities.

Airport panel discussion

Emphasizing the universal interest of roadbuilders in airport construction, the opening session was a 37-man panel on airports, under the moderation of Col. Floyd Evans, director, Michigan Department of Aeronautics. Moving along at a rapid clip, this "jam-packed" meeting heard each panel member present an authoritative brief discussion of one or more important phases of airport construction, operation and maintenance.

"The trend in design of concrete pavements, whether for airports or highway pavements, is toward the use of fewer expansion joints, or none at all," said A. A. Anderson, Portland Cement Association, Chicago. Ordinarily such joints are needed only at intersections of runways, taxiways and aprons. Spacing of contraction joints to control cracking of concrete pavement is best determined by local experience, but 20-ft. spacings usually will be found satisfactory when the aggregate is crushed stone, and 15 ft. if it is slag or gravel, he said.

In answer to a question relative to the usage of air-entrained concrete in airfield construction, Mr. Anderson declared it has a decided advantage in areas where considerable freezing and thawing occur, where ice and snow accumulate, or where the concrete pavement is subjected to scaling.

Vertical sand-drains

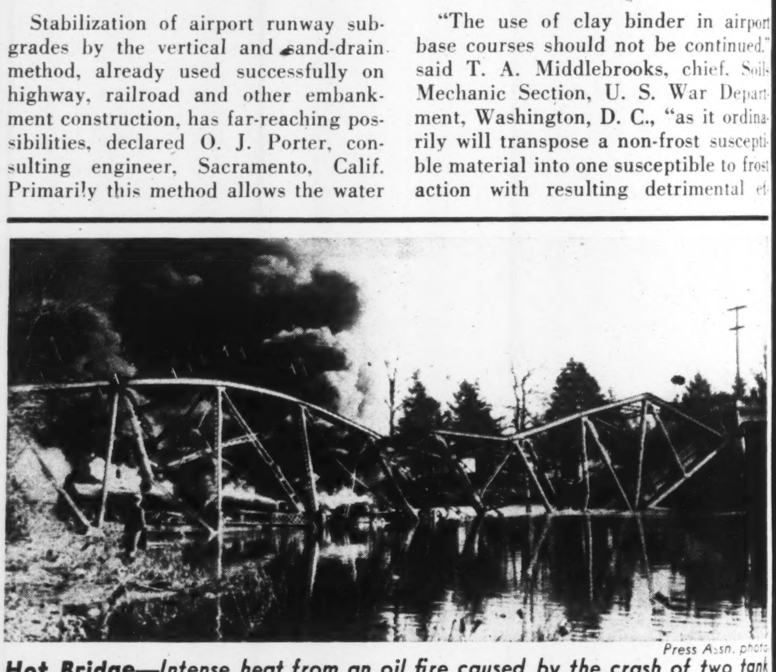
Stabilization of airport runway subgrades by the vertical and sand-drain method, already used successfully on highway, railroad and other embankment construction, has far-reaching possibilities, declared O. J. Porter, consulting engineer, Sacramento, Calif. Primarily this method allows the water to escape from saturated soft subgrade materials without causing lateral displacement, and speeds stabilization of the material.

Four methods have been developed for consolidating saturated materials by the vertical sand-drain method, said Mr. Porter. They are: (1) excavate 24-in. dia. holes with rotary buckets and backfill with sand; (2) drive a plugged hollow mandrel, fill it with sand, seal it at the top and expel the sand by air or water pressure as the mandrel is withdrawn; (3) jet a hollow mandrel in place and fill the hole with sand as the mandrel is withdrawn; and (4) drill holes with a high-speed rotary bit and a water jet, then remove the liquefied material by pump prior to installing the sand.

Until a satisfactory stability test is developed for granular materials in base courses under airport pavements, specifications for their installation must be based on experience in using the material in actual service, declared Col. Williams Mills, CAA, Atlanta, Ga. Design loads for airports vary from 4,000 to 120,000 lb., consequently, low quality materials must be used with caution even for the smaller airports carrying light loads under all-weather conditions.

No clay binder needed

"The use of clay binder in airport base courses should not be continued," said T. A. Middlebrooks, chief, Soils Mechanic Section, U. S. War Department, Washington, D. C., "as it ordinarily will transpose a non-frost susceptible material into one susceptible to frost action with resulting detrimental ef-



Press Assn. photo

Hot Bridge—*Intense heat from an oil fire caused by the crash of two tank trucks proved too much for the top chord of this steel bridge over the Washougal River on the Washington-Oregon border. Within fifteen minutes of the start of the fire, the girders became red-hot, and the 220-ft. bridge began to buckle, eventually sagging in the middle and slipping from its anchor on the east end. Bridge was a link in the Evergreen Highway—main route from Portland, Ore., to eastern Washington, and will be replaced by the Washington State Highway Department.*

Wins Lakefront Decision

In a decision that observers believe might spell the future of the $100,000,000 lakefront development planned by Cleveland, Ohio, the Ohio First District Court of Appeals recently held that no legal rights of shore property owners would be infringed by construction of the proposed Memorial Shoreway along Lake Erie.

The court also ruled that all access rights that private owners may have are subject to the superior right of the state in instances where the state wished to adopt the shore area to public use. The unanimous decisions reversed one made in Cleveland in June, 1945, by the Cuyahoga County Common Pleas Court.

Focal point of the lawsuit, brought against the city by private owners of properties fronting the lake, was the Fleming Act of 1917, which excepted "certain lands" from the state's superior right and made possible the granting of waterfront rights to several railroad companies.

The district court of appeals held unconstitutional the section referring to exemptions.

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$10 million Street Work

Ray F. Smock, Pennsylvania Secretary of Highways said recently that the department will proceed with the $10,000,000 Vine Street modernization project in Philadelphia.

In accordance with an agreement between state and city officials, the department proposes to vacate the properties, release proposal data and award contracts for demolition operations. Construction work will get under way as soon as possible. As soon as the properties can be vacated and the site cleared, construction of a surface highway will be started on plans prepared by the City of Philadelphia.

The Department has acquired the right-of-way for this improvement at a cost of approximately $3,000,000. The cost of the Vine Street paving is estimated to total about $10,000,000 by state engineers.

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Airport Expansion Out

The Saint Paul, Minn., Metropolitan Airports Commission, at a recent meeting, rescinded its former decision to expand Wold-Chamberlain Airport, on the ground that an entirely new site for a twin-city airport to serve both St. Paul and Minneapolis should be selected. The commission set April 9 for a hearing to consider further arguments for expansion of Wold-Chamberlain Airport, or for abandonment of the facility if a new field is built.

CONSIDER ATOMIC POWER

Keeping an eye on the possibilities of atomic energy in the production of electrical power, the city of Jamestown, N. Y., ordered its engineers to study the cost of scrapping its $4,000,000 power plant in favor of a newer and larger one.

Clyne Crawford, chairman of the city's Board of Public Utilities, said plans for a new plant should provide "plenty of spare space" that might be utilized for the adaptation of atomic energy. The present steam plant, built in 1891, is now undergoing an expansion to boost its output to 40,000 kw.

Portland, Ore., uses DDT

Portland, Ore., has purchased two surplus Stearman airplanes to help combat the mosquito menance next summer. The planes will spray a 5 percent DDT solution mixed in an oil base on 3,500 acres in Multnomah County. The city will manufacture its own larvicide, formulated by federal entomological laboratories.

City Commissioner Dorothy McCullough Lee, who has charge of the anti-mosquito campaign, reports that experiments conducted in Portland last summer, using an Army bomber from the Portland Army airbase, proved that aerial warfare is the most effective and fastest means of killing mosquito eggs. The plane did work equivalent to that of many men and reached areas beyond the the possible limitations of ground parties, she said.

Blast damages sewer

R. E. Hutchens and Andrews J. Nehf, engineers, have been directed to investigate a benzol explosion which tore up an 18-block stretch of Hulman Street, Terre Haute, Ind., recently, causing damage estimated by Paul Lindeman, city engineer, at $150,000.

The explosion tore up the pavement and sent manhole covers hurtling into the air. The danger of further explosions was averted when firemen placed hose lines in the damaged sewer and flushed the remaining benzol through to river outlets.

The blast occurred when about 2,000 gal. of benzol leaked into the sewer from a tank at the Indiana Gas and Chemical Corp. plant. It was not determined immediately what caused the benzol to explode.

Mr. Lindeman said it will cost about $5,000 a block to restore pavement damaged beyond repair, and that the cost of reconstructing sections of the 8-foot sewer, which may have been damaged beyond repair, will be about $40 a foot.

◆

Power Station Expansion

Construction of two 30,000 kw. generating stations and rehabilitation and expansion of the municipal electric plant, at a cost of about $18,000,000, is being considered by the Jacksonville, Fla., city commission.

The city plans to finance the building program through the sale of $15,000,000 certificates of indebtedness, and to obtain $3,000,000 from the plant's depreciation and reserve account. The plant's load had doubled in six years.

Open Salt Pile Reduces Snow Removal Cost—*Storing this pile of rock salt in the open at a city garage is said to contribute to lowering cost of snow removal in the city and increase mileage of streets kept clear in Newark, N. J. The city buys the salt loose in carloads, unloads it with a clamshell bucket direct from the railroad siding. Tarpaulins are thrown over the pile until it is needed, and a snow-loader is used to put the salt on trucks.*

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ts." Despite the common argument
favor of the clay binder that it facili-
tes compaction and gives greater
nsities, actually it results merely in
lling the voids with an inferior ma-
rial. The clean granular material ac-
ally would have greater load-carrying
rength if properly confined without
ding the binder, he said.

Speaking briefly on the problem of
rport drainage, J. M. Robertson,
ainage engineer. Armco Drainage &
etal Products, Middletown, Ohio, said:
Economics of the problem dictate that
orm drains be placed as shallow as
ssible to save excavation and to meet
tablished outfall elevations." Installa-
on of subdrainage lines, however, are
ore complex, he continued. Subsoil in-
stigations are necessary to determine
ee water table elevations, water-bear-
g strata and soil permeability. These
ta will indicate the location and depth
f installation for the drains, he said.

Use of bituminous materials

Experts in that field discussed briefly
ituminous construction for airports.
urton J. Bell, Corps of Engineers, At-
nta, Ga., stated that light grades of
ommercial tars produced for paving
urposes have definite advantages for
riming non-bituminous base courses.
urthermore, our experience in the
outheastern states indicate that satis-
actory service aprons may be built with
ense-graded, hot-tar, plant-mixed pav-
g mixtures, he said.

Four general type of asphalt pave-
ent are applicable to airport construc-
on, declared George Dent, district
ngineer, The Asphalt Institute, Wash-
ngton, D. C. As recommended by the
sphalt Institute, they are: plant-mixed
nd penetration macadam for heavy-
uty airports such as the Washington
ational Airport and La Guardia Field.
urface treatments and road mixes, in-
olving lighter types of surfacing are
etter employed on Class 1, 2 and 3
irports.

It is quite easy to increase the bear-
g capacity of a flexible airport pave-
ent after it is once built, continued
r. Dent. For instance, a low-cost
oad-mix pavement, with suitable base,
uilt to carry 15,000-lb. wheel loads,
an be strengthened to carry 70,000-lb.
oads by adding a second flexible plant-
ix pavement on the existing mixed-in-
lace pavement.

Location of airports

Proper location of airports, regard-
ss of their size, is of utmost im-
rtance, declared Hyman Shifrin,
nsulting engineer, St. Louis, Mo.
lass I airports, intended primarily for
rivate planes, should be located close
the residences of the users. Class II or III airports, for private commercial planes and feeder line service, should be within areas zoned for commercial or industrial purposes or along the outlying fringe of residential areas, he said.

Aerial approaches to airports can be protected in a number of ways, declared M. W. Torkelson, director, Wisconsin State Planning Board, Madison, Wis. Among those recommended are: (1) by mutual agreement between airport owners and owners of adjacent property; (2) by the purchase of lands involved; (3) by the purchase of air rights, which is advisable within certain limits; and (4) by proper zoning, he said.

Needed equipment developments

Desired developments in construction equipment and techniques for the future were outlined in reports by three moderators who had presided at the sessions of the recent ARBA-Highway Research Board conference, under the chairmanship of Harold F. Clemmer. Reporting for the soils construction session, Prof. Kenneth B. Woods, Purdue University, mentioned a suggestion that a thin rigid base covering plastic soils might furnish a solid bottom against which granular base course materials placed on top of the rigid mat could be compacted to satisfactory density. With present-day compacting methods, this degree of compaction is a practical impossibiilty in base courses placed on subgrade soils characterized by low bearing capacity with high rebound values. He pointed out the need for research to establish the relation between the compactibility of materials and the stiffness of the subgrade on which they are compacted.

Need was reported for vibratory equipment to compact granular and semi-granular soils, with prospects that such equipment might soon be developed. A need also was stressed for improved compacting equipment to be used in backfilling trenches and small culverts. The report brought out, also, a great need for equipment to speed the drying operation for soils with a moisture content in excess of optimum.

For concrete paving, a report by Charles W. Allen, Columbus, Ohio, emphasized the importance of improving the bearing between steel forms and subgrade, with form sections securely locked and adequately staked; the trend is to use 30-in. stakes in granular subbases. Heavier mixers than the 34E dual-drum are not desired by most engineers, according to the report. For transit mixers, there is hope for a device to record visually, not graphically, the number of revolutions of the drum. This unit would help control the problem of over-mixing air-entrained concrete. A device still is being sought to control the consistency of concrete. Value of vibration in pavement concrete, including air-entrained concrete, perhaps is not being sufficiently exploited in this country, the report indicated.

Road show for 1948

In a report to the convention on his second year as president of ARBA, James J. Skelly announced that the first postwar Road Show would be held in the Tucker plant, Chicago, the week of Feb. 16, 1948. Charles M. Upham, engineer-director of ARBA, and J. Thomas Callaway, newly elected president, revealed widespread expressions of intense interest in the 1948 show by manufacturers and users of equipment. The two men confidently predicted that next year's exhibit would be the greatest ever assembled of construction machines and tools.

Through the efforts of ARBA, with cooperation of government agencies, Mr. Skelly reported, 21 Latin-American engineers and 14 from other parts of the world have participated in a one-year training course of the Inter-American Highway Engineering Conference in this country. The course soon will be concluded. A dozen of the visiting engineers were present at the convention.

Executive officers

J. T. Callaway, Goodyear Tire and Rubber Company, Chicago, Ill., was elected president of the American Road Builders' Association for 1947, succeeding James J. Skelly, contractor, of Media, Pa., who has been president for the past two years. H. C. Whitehurst, director of highways, District of Columbia, was reelected treasurer.

Chosen for regional vice president are: Paul B. Reinhold, Pittsburgh, Pa., and Robert A. Allen, Carson City, Nev., both of whom succeed themselves; Charles W. Smith, Pensacola, Fla., succeeding Alex F. Hancock of Mobile, Ala.; W. A. Roberts, Milwaukee, Wis., succeeding E. R. Galvin of Cedar Rapids, Iowa.

Newly elected divisional presidents include: W. Bruce Chilson, Falconer, N. Y., County Highway Officials' Division; G. M. Shepard, St. Paul, Minn., Municipal Division; Donald O. White, Chicago, Ill., Highway Contractors' Division; Maj. Gen. Julian L. Schley, Baltimore, Md., Airport Division; and W. B. Greene, Aurora, Ill., Manufacturers' Division.

A. O. Cuthbert, Lansing, Mich., was elected president of the American Institute of Local Highway Administration, organized last year as a section of the County Highway Officials' Division.

MEN AND JOBS

Col. Peter P. Goerz has been named director of real estate, Office of the Chief of Engineers, succeeding Col. Albert H. Burton. **Col. Clarence C. Haug** succeeds Colonel Goerz as executive officer, Office of the Director of Military Construction. The director of real estate has charge of the acquisition and disposition of all real estate purchased or sold for the Army. Colonel Goerz was graduated from the U. S. Military Academy in 1918 and from the Engineer School in 1921. He served in the Pacific during the war.

Colonel Haug was graduated from the U. S. Military Academy in 1935 and from Cornell University in 1938. He was assigned to London, England, in 1940, with the Services of Supply.

Life memberships in the ASCE were presented to these three members of the Pittsburgh, Pa., section at a recent meeting. They are (left to right) T. R. Beeman, senior engineer, USED, Pittsburgh district; A. C. Ackenheil, consulting engineer, and H. A. Saurbrey, chief construction engineer, Westinghouse Electric Corp.

Ray Warren, former city engineer of Greensboro, N. C., and former executive director of the Greensboro Housing Authority, has been separated from the Army with the rank of lieutenant colonel, and has opened offices at 206 Library Place, Greensboro, as a consulting engineer. A graduate of the U. S. Military Academy at West Point, he later left the Army to become city engineer at Washington, N. C., and joined the municipal engineering department at Greensboro in 1922. He became director of the housing authority in 1940.

S. B. Bubier is at present with the U. S. Army Engineers as construction engineer in Tokyo, Japan.

Ford, Bacon and Davis, Inc., engineers, Chicago, have announced the election of **Everett S. Coldwell** as executive vice-president. Mr. Coldwell has been a staff member since 1926 and a vice-president since 1941. He is a director of both Ford, Bacon and Davis, Inc. and Ford, Bacon and Davis Construction Corp.

Thomas R. Camp, Herman G. Dresser and **Jack E. McKee** have formed a partnership as consulting engineers with offices at 6 Beacon Street, Boston, Mass. The firm will specialize in water and sewage works and the treatment and disposal of municipal and industrial wastes.

Subsurface construction work was by-passed as a conversational subject as these three New York constructors met during the recent Moles' Award Dinner. Left to right are: Richard Hyland, of Madigan-Hyland, New York City; Thomas F. Farrell, chief engineer, New York State Department of Public Works, and Charles P. Gross, head of the New York City Board of Transportation.

Reno R. Walker has been elected president of the Engineering and Development Corp. of Chicago, Ill. Mr. Walker, served as a major in the Coast Artillery Corps in the South Pacific theater. He joined his present company as head of the structural department upon release from the service in October, 1945.

William H. Moore, Akron, has been named chief engineer of Division No. 4, Ohio Highway Department, Ravenna, in charge of Summit, Stark, Portage, Ashtabula, Mahoning, and Trumbull counties. He was formerly division engineer and for 12 years was deputy Summit County engineer in charge of maintenance.

Merton R. Ackerman, North Monroeville, Ohio, has been named Huron County superintendent of the Ohio Highway Department, succeeding **Morley K. Price,** resigned.

Col. Anderson T. W. Moore, for the last two years chief of the personnel division, Office of the Chief of Engineers, has been ordered to Los Angeles, Calif., where he will succeed **Col. Robert C. Hunter** as district engineer, Los Angeles Engineer district. Colonel Hunter will go on terminal leave, preparatory to retirement. **Col. Edwin P. Locke, Jr.,** will succeed Colonel Moore as chief of the personnel division. Colonel Locke has been in the European theater where he was, until the recent change in assignment, chief of the information and education division, Headquarters, U. S. Forces.

Lieut. Col. Kenneth H. Newton has been assigned to replace **Lieut. Col. T. P. McCarthy** as executive officer of the Little Rock, Ark., district office, U. S. Engineers. Colonel McCarthy will be assigned to overseas duty.

Ernest L. Stockton, recently named district engineer at Albuquerque for the New Mexico State Highway Department, is relinquishing that post to accept appointment as a major in the regular Amy. Stockton, who was graduated from West Point in 1937 and served as a major during the last war, has received notification of his appointment as a major in the U. S. Army Engineers. He was assistant district engineer at Albuquerque from 1936 through 1938 and district engineer for the next two years. After four years of Army service, he returned to the highway department as a maintenance engineer with the state office in Santa Fe. His successor has not been announced.

Jack Lay has resigned as Jefferson County engineer at Port Townsend, Wash. He has held the position two and a half years.

When **Edward D. Alexander** retired recently as treasurer of the Seattle Engineers' Club, a position he had held for 30 years, he was made a life member. A 1906 civil engineering graduate of the University of Washington, Alexander is senior civil engineer in the city engineering department.

Don Akins has resigned as Kittitas County engineer at Ellensburg, Wash.

R. M. Parsons has been named acting district engineer for the Idaho Bureau of highways at Coeur d'Alene, succeeding E. W. Swan. He was with the department until 1940 when he went into federal government work, most recently with the public works department at the Farragut naval base.

Paul M. Snell of Wilmington, N. C., chief of the consultation division, Wilmington District, Corps of Engineers, has been assigned by the Engineers Corps to make a survey for the Venezuelan government of proposed improvements to enlarge Lake Maracaibo harbor.

J. C. Northcott has been named senior highway inspector for the 10th Division of the North Carolina Highway Commission.

Eugene L. Moseley, country road superintendent for the last 15 years for Kershaw County, S. C., has resigned to enter the road construction business.

Frank Kugler, senior right-of-way engineer with the North Carolina State Highway and Public Works Commission, has resigned.

Thomas H. F. Norris has been made acting superintendent of day labor, Illinois Division of Highways, Springfield, since the resignation of H. B. Fay. Norris has been with the Illinois Division of Highways for 23 years. Since 1937, he has been assistant district construction engineer, District 6, stationed at the office at Springfield.

Cecil Linwood Stearns, senior auditor in the accounting department of the North Carolina Highways and Public Works Commission, has been awarded the annual McCrary Award for his outstanding accomplishments.

Leonard H. Dicke, formerly with the U. S. Engineers at the St. Paul, Minn., and Los Angeles, Calif., districts, has transferred to the Bureau of Reclamation, Denver, Colo. He is employed as engineer in the hydrology division of the branch of Project Planning.

Col. Willis E. Teale is the new U. S. District Engineer for peninsular Florida, succeeding **Col. A. B. Jones,** for the last three years in charge of military supply and construction and river and harbor work. A graduate of the U. S. Military Academy, 1917, during the war Colonel Teale organized and commanded the 38th Combat Engineer Regiment and served for two years as chief engineer of the U. S. Army Forces in Australia and of the Services of Supply of the Southwest Pacific area. Upon his return he was named Commanding Officer, Albany Engineer Depot, and in June 1946, Commandant of the Army Engineer School, Fort Belvoir, Va. In World War I in France he was with the 7th Engineers. In 1923, he completed post graduate work at the Massachusetts Institute of Technology. For two and a half years he was secretary of the Mississippi River Commission with the Division Engineer in St. Louis, handling flood control works along the upper Mississippi River. Colonel Teale was on duty with the American Battle Monuments Commission, Paris, France, and later was assistant to the North Atlantic Division Engineer in New York, District Engineer at Mobile, Ala., and associate professor of mathematics, U. S. Military Academy.

Louis B. Ackerman recently was named resident engineer for the Bureau of Reclamation to supervise construction of Potholes Dam, a part of the Columbia Basin Project in Oregon.

J. B. Bonny (left) vice-president of Morrison-Knudsen Co., Inc., is congratulated by H. W. Morrison on his promotion to the position of general manager of that well known organization.

Construction planning at Garrison Dam comes largely under the supervision of these three men, located in the Garrison District Office. Left to right: J. W. Sibert Jr., chief, construction division; John E. Ott, chief of the soils merchanics section; and G. J. Gavin, chief of operations, construction division, on the project.

State tunnel authority sought in Massachusetts

The Postwar Highway Commission has recommended to the Massachusetts legislature the creation of a state tunnel authority to take over the Sumner Tunnel and direct construction of a new parallel tunnel under Boston Harbor.

Initial cost involved in taking over the existing tunnel and outlay for new approaches would be $27,219,337, exclusive of the cost of a new tunnel. The proposed authority would issue bonds amounting to $19,000,000. After payment of outstanding bonds—at the end of 30 years—the tunnels would be turned over to the state Department of Public Works.

Urge operating changes in Pa. highway system

Drastic changes in methods of operating Pennsylvania's 100,000-mile high system were recommended last week in reports submitted to a special state legislative commission.

The proposed plan would take all boroughs and townships in the state out of the road business and turn both construction and maintenance over to the counties. Cities would continue to administer their street systems, except for state highways which traverse them.

Counties and cities would continue to receive state aid from the tax on gasoline, counties receiving money now going directly to the boroughs and townships.

The State Highway Department would handle between 25,000 and 30,000 miles of the most heavily traveled roads and streets—arteries which carry 60 percent of total traffic.

Building site acquisition sought by highway board

A bill giving the North Carolina State Highway Commission authority to acquire land or property either by direct purchase or through condemnation proceedings on which to erect buildings for offices, garages, shops or prisons, was introduced in the North Carolina Legislature Feb. 7.

At present the commission has the right to condemn property only for highway purposes and for several years it has been negotiating unsuccessfully for land adjoining the state highway building at Raleigh for use in connection with the erection of a proposed new highway building.

Engineering Foundation seeks research bequests

A. B. Kinzel, chairman of the Engineering Foundation, Engineering Societies Building, 29 West 39th Street, New York City, has announced that in view of the increase in opportunities for productive research in the field of engineering, the foundation would welcome bequests and gifts to supplement its current principal fund of about $1,000,000.

The foundation has been engaged in important research activities for more than 30 years since its creation in 1914 by the four founder societies in the engineering field—the ASCE, AIMME, ASME and AIEE.

"It is hoped," said Dr. Kinzel, "that a great 'community trust' for engineers might be contributed to by many persons and organizations, thereby making available sufficient income to support worthwhile investigations to advance fundamental research in engineering and promoting the public good. This hope has been realized in part. The foundation would welcome further gifts and bequests, the income from which could be used to carry on or to aid carefully chosen research projects."

Surplus LST triply Useful to contractor

A surplus Landing Ship Tank, 358 ft. long, has been reconditioned by the Gahagan Construction Co. New York City to transport pipe and supplies to accompany its sea-going dredges, and for use as quarters for the dredge crew.

Refitted inside with monorail hoists, it can stow the equipment needed for the dredge and also carry a deck load of pipe and even the work tugs required. Derricks of 30-ton capacity are to be set fore and aft to assist in loading and unloading.

One such vessel already is in service and has been taken to Amuay Bay, Venezuela, where 4,300,000 cu. yd. will be excavated for Creole Petroleum Corp., by the Peru, a 4,000-hp., 29-in. suction, 24-in. discharge dredge. Quarters aboard will accommodate 100 men, about double the present crew.

Marine requirements for commercial registry are such that it is not practicable to operate the LST as a ship so the propellers have been removed and the vessel is towed where required. Power units aboard are retained, however, for cargo handling purposes, lighting, and possibly for supplemental electric power to shore establishments in isolated places.

Asks bids next month for Trans-Cascade road

Bids will be called for in March b the Public Roads Administration f construction of the last bottleneck o the Trans-Cascade North Santiam hig way, connecting eastern Oregon wi the lower Willamette valley. The ne road also will be used as an access t the site of the Detroit Dam, to be con structed as a part of the Willamet valley flood control project.

Construction of the 10-mile unit nea Detroit, Ore., will involve removal o more than two million yd. of ear and construction of 6.500 cu. yd. o masonry. It is planned to have th route open to travel in 1948.

Wage body imposes fine totaling $12 million

The National Wage Stabilizati Board, which went out of existence Fe 24, imposed income tax disallowances o $12 million against employers in th 14 months it operated. Since direct co trols against wage increases were i effect, until Nov. 9, only in the buildi and construction industry, and the were few wage decrease violations, mo of the Board's disallowances we against contractors in this industry.

NWSB took action against 5.500 em ployers. It is turning about 50 unfi ished cases over to the Bureau of I ternal Revenue's Salary Stabilizati Unit. Employers still may be penalize for any unrevealed unlawful adju ments that took place while contro were in effect. But it is unlikely th any action can be taken after thr years, unless criminal action is conte plated.

National road safety mee scheduled for June 18-20

A White House announcement la week said plans have been completed t reconvene the "Action Program" grou of the 1946 President's Highway Safe Conference. Suggestion that a ne meeting be called was credited to thr national coordinating committees esta lished last week. These include th committee representing state official another comprised of federal agenci concerned with highway matters, an the national committee of civic organiz tions interested in safety.

The meeting will be held in Washin ton, D. C., on June 18,-20, with Ma Gen. Philip B. Fleming, of the Feder Works Agency in charge.

California agency reveals own plan for new San Francisco-Oakland bridge

Recommends structure parallel to existing Bay Bridge—Sets total cost at $99.3 million for double-deck structure

The California Department of Public Works on Feb. 15 recommended building a new Oakland-San Francisco Bay bridge parallel to the existing bridge. The announcement came less than two weeks after an Army-Navy board's proposal of a low-level bridge between San Francisco and Alameda, some distance south of the present structure. (*ENR* Feb. 13, vol. p. 237)

Estimated cost of the twin bridge and approaches, including a tube connection to Alameda, is $99,300,000, compared to the $134,468,000 construction cost for the Army-Navy favored crossing. Both plans include an estimate of $21,000,000 for twin two-lane tubes under the Oakland Estuary with connections to the East Bayshore Freeway and to Alameda. These estimates are made on the basis that interest would be liquidated during construction with revenue from the present bridge.

The state-backed bridge would be of double-deck construction, with five wider lanes substituted for the six on the upper deck of the present span and five for the three automotive and two electric train lanes on the lower deck. It would be located about 300 ft. north of the existing bridge. It would not carry rails. On this latter subject, the report states that "since the bridge railway is capable of handling twice as many passengers as now use it, and can be made to handle more if necessary, no provision for additional rail facilities seems justified."

Advantages cited

C. H. Purcell, director of the public works department, cited nine reasons for his report favoring the construction of a second bridge paralleling the first:

1. It affords the greatest and longest-lasting relief for the traffic congestion on the present bay bridge.

2. The cost per additional transbay traffic lane is less than that of other practicable crossings, due to the type of structure, favorable foundation conditions and the use of proven construction methods.

3. The time and cost of engineering investigation and design will be less than for any other crossng, since plans for the present bridge can be used as a pattern for the new structure.

4. Substantially lower costs of administration, operation and maintenance will be possible.

5. Many duplications of present operating facilities and appurtenances can be avoided.

6. The two structures in close proximity lend themselves to the greatest flexibility of operation, allowing each to be operated as a one-way bridge if desired.

7. No additional hazard to navigation, interference with anchorage areas or obstruction of the glide angle for airplanes will result from its construction.

8. It will connect directly with the Bayshore Freeway in San Francisco to be built by the state, providing four points of distribution in the downtown business district.

9. It terminates at the focal point of East Bay traffic arteries connecting with the East Bayshore Freeway (north and south) and MacArthur Boulevard.

The state's report explained further that the parallel location was favored after it was determined that only 20 percent of the traffic would be diverted by a bridge between Potrero Point and Alameda.

Those opposing the state plan object that another crossing close to the present bridge would dump more traffic on San Francisco's already overloaded downtown streets. The answer to this is that any new bridge terminal south of Market St. will produce much the same traffic conditions with respect to access to the center of the city's traffic, the Market St. area.

Proposed bills considered sure to pass the state legislature provide for $950,000 with which "to complete preliminary investigations and start design studies". Other measures have been introduced in the legislature in behalf of the state's Toll Bridge Authority designed to expedite the financing of a second bay crossing. The proposed bills are enabling acts, general in nature, which amend the California Toll Bridge Authority Act to provide specifically for issues of revenue bonds to be retired from the revenue and other income of the existing bridge and any new bridge or other highway crossing that may be built.

The bills authorize a single bond issue sufficient to redeem outstanding bonds on the existing bridge and to provide funds for a new crossing.

MAJOR MEETINGS

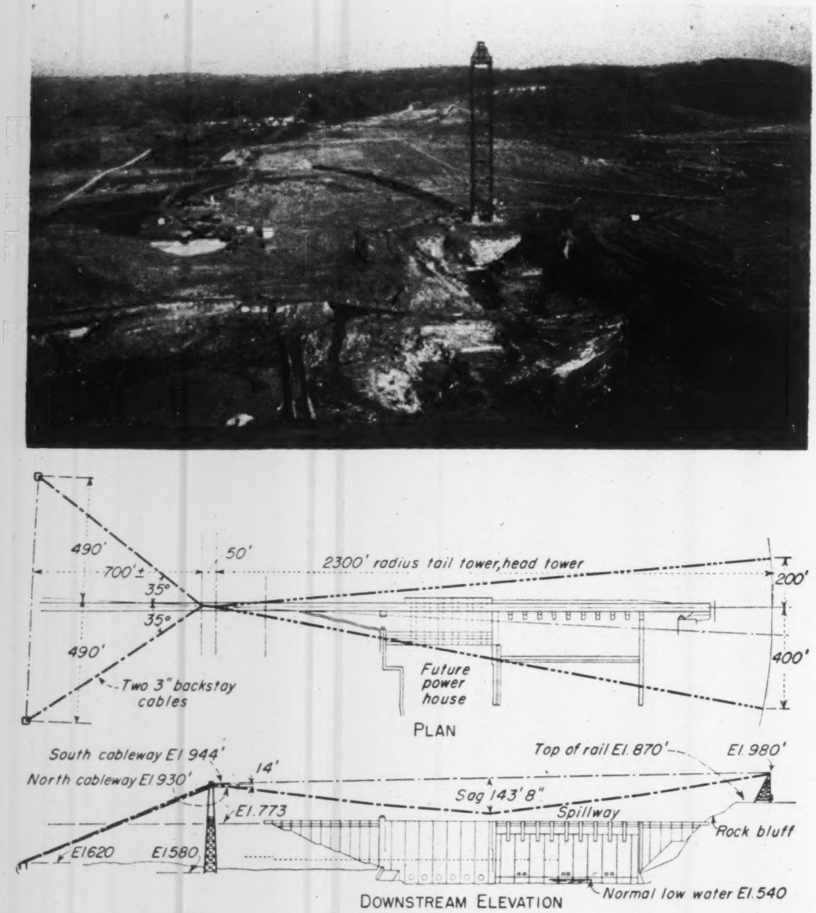
National Sand and Gravel Association, 31st annual convention, Biltmore Hotel, Los Angeles, Calif., March 3-7.

Mississippi Valley Conference of State Highway Departments, 38th annual meeting, Edgewater Beach Hotel, Chicago, Ill. Mar. 14-15.

American Railway Engineering Assn., Palmer House, Chicago, Ill., Mar. 18-19.

***Aqueduct Work Proceeds**—Salt Lake Aqueduct, which is part of the Provo River irrigation project, will carry water from Deer Creek Reservoir to Salt Lake City. More than half of the 41-mi. of gunite-coated steel plate pipe has already been put in place for the project.*

Wolf Creek Dam ready for concrete



Two 2,300-ft. cableways span the Cumberland River at the Wolf Creek Dam site, supported from a single fixed tail tower and by head towers that travel along 600 ft. of arc. Top photo shows tower during erection.

Wolf Creek Dam, a rolled fill and concrete structure on the Cumberland River near Jamestown, Ky., is nearing the concreting stage with excavation for the powerhouse well under way and the cableways now in service.

Construction on the Corps of Engineers project is being done by J. A. Jones Construction Co., Inc., of Charlotte, N. C., and Wright Contracting Co. of Columbus, Ga., as joint ventures. The work was started in 1941 by S. A. Healy Co., who placed about 2,500,000 cu. yd. of the 9,500,000 cu. yd. of rolled and random fill and had part of the equipment installed for placing the 1,400,000 cu. yd. of concrete in the 250 ft. high gravity dam when work was stopped because of the war.

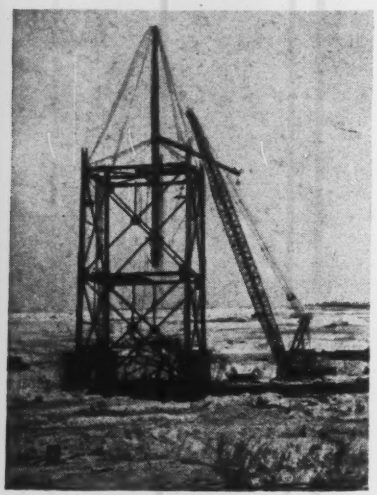
Key dam of the flood control system on the Cumberland, Wolf Creek will store a total of 6,000,000 ac.ft. of water. Reservoir capacity at the fixed spillway crest is 4,000,000 ac. ft. at a 168 ft. head. Six 20-ft. dia. penstocks are to be placed for a powerhouse planned for an ultimate installation of 250,000 kva. About 2,000,000 ac. ft. of storage above the spillway crest is reserved for flood control and is regulated by ten 50x37-ft. tainter gates. A little more than 2,000,000 ac. ft. is available for power.

Aggregate rock is quarried and given preliminary crushing at a quarry 12 miles from the dam site on a newly built access road. Final processing of the aggregates is made on the high west bank of the river. Aggregates are delivered by belt conveyor to the top of a 100-ft. high mixer plant equipped with automatic batchers and three 4-cu. yd. mixers. This plant is set just below the top of the cliff and will supply concrete via transfer cars to 8-cu. yd. buckets kept on the cableway carriage.

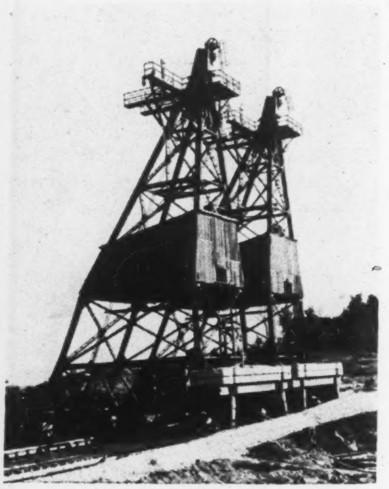
Single 370-ft. head tower

Two 110 ft. high travelling head towers (rebuilt from the 75-ft. towers used at Norris Dam) are mounted on the crest of the cliff. A single fixed tail tower rises 370 ft. from the flood plain at El. 580 to come within 30 ft. of the head tower elevation. The tail tower will be embedded in the fill to El. 773, the top of the dam, and that much is left permanently in the fill.

A 3-in. dia. lock-coil cable is used for each of the cableways with take-ups on the span side of the tail tower. The two track cables are held by separate systems of backstays each made from two pieces of 3 in. cable, salvaged from main-span use of the cableways on other projects.



The tall tower was erected by a derrick supported in a cable basket.



The traveling head towers, located on the high west bank, are 110 ft. high.

Concreting is expected to start early this year using 3 to 3½ bags of cement per cu. yd. Cement will be a blend of modified portland and natual cement with an air-entraining agent ground in. Lifts will be limited to 5 ft., a modified low heat portland cement will be used, mixing water will be cooled and ice may be added to aggregates prior to mixing but cooling pipes in the dam are not planned.

Cantilever forms, all of steel except the sheathing for the downstream face, have been fabricated for the project.

H. V. Appen is general superintendent for Jones-Wright, G. E. Murphey is concrete superintendent and W. D. Kirk is embankment superintendent. Col. H. V. Canan is district engineer, for the Nashville District, Corp. of Engineers, War Department, J. I. Bowman is resident engineer at Wolf Creek.

PERSPECTIVE . . . .

Underground Factories?

Manufacturers and construction men may well keep a close watch on Army and Navy moves on dispersal of manufacturing plants and construction of underground factories and worker communities.

The military has at present no law to compel that war materiel suppliers scatter their facilities or put them underground. But, if peace fails and if air attack threatens, Congress could order essential industry to disperse or burrow under.

The Army's Corps of Engineer is now making a survey of abandoned mines and caves that might accommodate manufacturing plants, and a report is expected soon by the Army-Navy munitions board. Meanwhile, a War Department Civil Defense Board is scanning the problem of civilian protection from air attack. This survey inevitably includes plant location, since every factory must have its workers housed nearby. And the Army Air Forces and Ordnance Department, and Naval engineers are also deeply involved in plans and surveys on the same problem—trying to determine means of shelter from wars to come.

They have some solid information: Data on plant protection in Japan, Germany, England, Sweden, Italy and France; their own figures on how much of what type of coverage it takes to damp a bomb blast; and the current survey of caves and mines.

Caves not suitable

The Corps of Engineers is expected to report that natural caves—though numerous—are so uneven in contour, so poorly ventilated, so short of floor area and overhead clearance, and so far (in general) from transportation and raw materials as to be impracticable.

On the other hand, mines and quarries have better air, more level floors, and are usually closer to transportation. Mining of horizontal strata—as lead and zinc in Oklahoma, Missouri and Kansas—produces cavities most suitable for industrial installations. Of course, many drawbacks of natural caves also apply to the mines—poor ventilation and drainage, for example, would continue to be a problem.

War department engineers have expressed the opinion that burrowing into hillsides might be cheaper than either caves or surface construction—depending on the rock formation. Soft rock, able to support wide ceiling spans is best—and there seems to be plenty of it.

In any case, if the government should decide on subterranean production, it would mean excavation on a big scale.

Everything goes under

Not only plants and housing, but even airports can be buried. The Russians reportedly have just completeted the world's largest underground airport.

Reports on Sweden's buried plants (*ENR* Dec. 5, 1946, vol. p. 754) indicate that costs run about 15 percent more than for surface construction, but maintenance savings soon even the score.

The Germans buried a number of aircraft and other factories, but most of these fell under the heading of "too little and too late". Actually, large-scale construction of underground factories was initiated in 1944, and in the last months of that year accounted for about one-sixth of the total construction and about 40 percent of the industrial construction carried out.

The Japanese gouged out an underhill naval base at Yokosuka, including a submarine plant, in three years, and housed about 70,000 workers there.

Canada builds homes to reach 1946 goal

Canada's 1946 goal of 60,000 housing units, announced last July (*ENR* Aug. 8, 1946, vol. p. 148), has been achieved, according to a summary presented to the House of Commons by C. D. Howe, Reconstruction Minister.

Wartime Housing Ltd. constructed 6,812 emergency housing units during 1946 and had 4,066 units under construction as the year ended. There are now over 25,000 housing units in use throughout the dominion that have been built by this "crown company".

The life insurance companies of Canada, acting through their jointly owned subsidiary, Housing Enterprises of Canada Limited, have about 3,300 housing units under construction; only a few were occupied at the end of 1946 but many were approaching completion. Under the terms of the National Housing Act, administered by the Central Mortgage and Housing Corp., loans totalling $60,000,000 were made during 1946.

◆

Wood veneer prefabs to be developed

Research to develop prefabricated houses using a new type of wood veneer made from low grade, and at present unused, peeler logs is being sponsored by the industrial research and development division of the Commerce Department's Office of Technical Services, John C. Green, OTS director, has announced.

Under the terms of a 6-month "actual cost" contract with the Elmendorf Corp., Chicago, Ill., a private research organization, a complete model prefabricated structure, incorporating the new panel, will be designed, built, and tested under specifications which were prepared by the National Housing Agency.

The panel, called "K-Veneer", uses a veneer 3/16 in. thick made from Western hemlock peeler logs. In processing, the veneer is slit grain-wise at half inch intervals, leaving only enough fiber at the base of the incisions to hold the material together. At the same time, under tension, the veneer is expanded in area by about four percent. The incisions provide a slack in the veneer that prevents later distortion due to absorption of moisture from the atmosphere. Depending on its intended use, the veneer is strengthened by an overlay of sheet aluminum, sheet steel, roofing felt, heavy paper, or other material attached by waterproof glue under pressure.

ENGINEERING SCHOOL NEWS

Matthes Foundation will help Latin American students at Carnegie Tech.—First loan made by Canadian foundation—Timber engineering at Virginia Polytechnic Institute

Simultaneously with the announcement of the formation of a new education foundation—The Matthes Foundation, Inc.,—comes the news that the foundation is offering three $1,000 fellowship awards this year to Latin American students who can qualify for graduate work at Carnegie Institute of Technology, Pittsburgh, Pa., in engineering, physics, chemistry and mathematics. The Foundation is sponsored by Albert J. Matthes, president of the Machinery Liquidating Co., of New York City.

Recipients of the fellowships will be chosen as a result of competitive examinations under the auspices of the Graduate Record Office of the Carnegie Foundation in the candidates' respective communities on, or about, March 31, 1947.

Inauguration of an educational fund to help university students to become engineers or scientists, has also been announced by the Engineering Institute of Canada. For some months, a campaign has been carried on among the institute membership to raise at least $25,000 for this purpose, and although the campaign is still in progress, the first loan has now been made to a deserving student.

The objects of the fund are to establish engineering and science scholarships and fellowships, to encourage, by financial assistance and otherwise, the establishment and maintenance of engineering and science departments in schools and colleges, to make loans to deserving students to enable them to pursue engineering and scientific studies, and generally, to promote the study of engineering and science.

The fund is known as the "Harry F. Bennett Educational Fund of The Engineering Institute of Canada", in memory of the late Harry F. Bennett who, for six years prior to his death, was chairman of the Institute's Committee on the Training and Welfare of the Young Engineers.

The establishment of a department of wood construction in the school of engineering of the Virginia Polytechnic Institute, Blacksburg, Va., with E. George Stern as head, was approved by the council of administration and the faculty committee of graduate programs and degrees on Jan. 25. Dr. Stern who is also director of the V.P.I. wood research laboratory, was research engineer of the V.P.I. Research Foundations, Inc., from 1941 to 1946, when he was transfered to the faculty of the institute. The new department will offer five courses open to graduate students and seniors having the prerequisites. The degree of Master of Science in Wood Construction will be given. The timber engineering course will include:

An introduction into modern timber engineering with emphasis and laboratory experiments on nailed, glued, and connectored, built-up and laminated timber structures, including the structural use of plywood.

George M. Armstrong, Jr., a graduate of Massachusetts Institute of Technology and a Navy veteran, has joined the department of engineering research at North Carolina State College, Raleigh, N. C., as a research engineer.

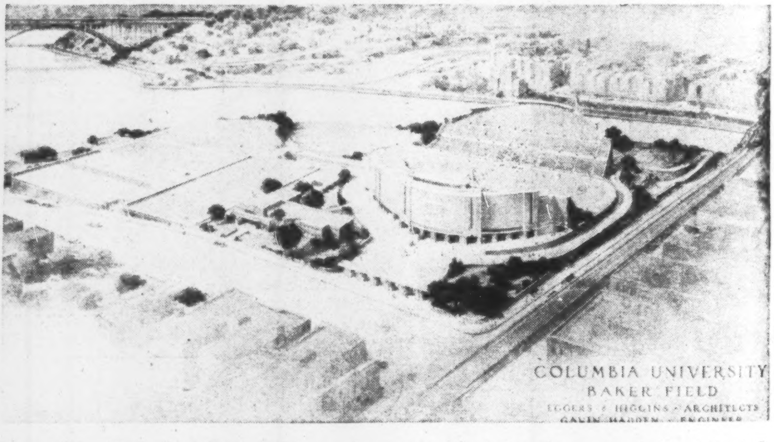
Three buildings and much laboratory equipment have been allotted to Louisiana Tech by the bureau of community facilities of the federal works agency and the United States office of education, President Claybrook Cottingham has announced.

Lake Michigan diversion to Ill. waterway studied

Governor Dwight H. Green of Illinois has announced the appointment of a special committee to study the desirability of federal legislation to increase the diversion of water from Lake Michigan into the Illinois waterway.

Acting upon the recommendation of a special committee of the Chicago Sanitary District, which has been investigating the subject, Governor Green appointed Anthony Olis, newly-elected trustee of the Sanitary District, as chairman of the 5-member state commitee. Others appointed are: Thomas B. Casey, chief state waterway engineer; Ralph Morgan, Peoria engineer who is chairman of the Peoria Chamber of Commerce flood relief committee; Oscar E. Hewitt, Chicago commissioner of public works, and Albert J. Meserow, Chicago attorney.

In a report made public Jan. 17, the Sanitary District committee declared that the present limitation on diversion of 1,500 cu.ft. of water per second from Lake Michigan is inadequate properly to sustain navigation on the Illinois waterway, and to safeguard public health and sanitation. The committee recommended that legislation which would increase the diversion rate be introduced in the Congress at this session. Its report stated that since the present rate was fixed by the United States Supreme Court in a decision rendered in 1930, the circumstances had changed radically.



***New Stadium for Columbia**—Announcement has been made by Frank D. Fackenthal, acting president of Columbia University, that a new stadium, seating about 45,000 spectators, will be part of a long term program for improvement of facilities. Eggers & Higgins are the architects, and Gavin Hadden the engineer for the Baker Field project. A new field house also will be part of the replanned Baker Field at 218th Street and Broadway, Manhattan. A new gymnasium, for the future, will be at Morningside Heights.*

OBITUARY

D. J. Fair, 70, former director of the Kansas State Highway Commission, died recently. During the eight years he had been director he was instrumental in starting an extensive improvement program including a secondary road system calling for 20,000 miles of farm-to-market roads.

William J. Alexander, 62, civil engineer of Seattle, Wash., died there Feb. 8.

Henry F. Blood, 63, consulting engineer of Portland, Ore., died there Jan. 25. A Portland resident for 40 years, he designed the 12-story Rust Building at Tacoma, Wash., did consulting work on the fishways at Bonneville Dam and collaborated on numerous school projects. During the war years Mr. Blood was connected with Timber Structures, Inc.

Maj. William P. Wickham, 53, Corps of Engineers, died Feb. 7 in Fort Lewis, Wash. He served two terms as engineer of bridges in Huron County, Norwalk, Ohio.

Paul Meredith, 65, founder of the Meredith Construction Co., Indianapolis, Ind., died Feb. 6. He was first president of the Indiana Contractors Association in 1926.

Watson Harmon, 63, who retired in 1939 after six years as president of Harmon - Hodge - Hammond Co., construction engineers of New York City, died at Scarsdale, N. Y., Feb. 15. A civil engineer graduate of the University of Michigan, Mr. Harmon had been sanitary engineer for Toledo, Ohio, and later manager of the New York office of the Northwestern Engineering Co. of Chicago.

Noah J. Shofner, 54, construction engineer of Lufkin, Texas, died at Corrigan, Tex., Jan. 27.

Maj. George Hall, engineer, of Lindsay, Ont., died there Feb. 12.

J. L. Campbell, 63, former maintenance engineer with the Pennsylvania Department of Highways, died in Pittsburgh, Pa., Feb. 10.

George Huss, 89, of Stone Lake, Wis., engineer who took part in the building of several railroad lines in Mexico, East Africa and Palestine, died in La Grange, Ill., Feb. 15. Educated at Cornell University, after his career in railroad building he became president of the Northern Electric Railway, Chicago.

Arthur J. Hatch, 72, former Lucas County, Ohio, surveyor and founder of the Arthur J. Hatch engineering firm, died in Toledo, Feb. 16. During his term as surveyor (1908-16) he invented equipment to test strength and density of concrete. Later he supervised the construction of the Waterville, Ohio, and Grand Rapids bridges. Mr. Hatch was village engineer at Maumee and Waterville, Ohio, from 1930 to 1938.

Alexander D. Allen, died at Hamilton, Ont., Feb. 16. A graduate of the McGill University 1911. Mr. Allen founded the firm of the Allen Engineering Co. Ltd.

Frank N. Overdeer, 81, president of the W. D. Haddock Construction Co., Wilmington, Del., died there Feb. 16. Mr. Overdeer had built more than 50 churches, and directed the construction of many other Delaware buildings.

Clement C. Williams, 65, president of Lehigh University at Bethlehem, Pa., from 1935 to 1944, died Feb. 20 at Madison, Wis. An authority in the field of masonry construction and author of many books on the subject, he became president of Lehigh after holding the posts of head of the civil engineering department of the University of Illinois and dean of the College of Engineering at the University of Iowa.

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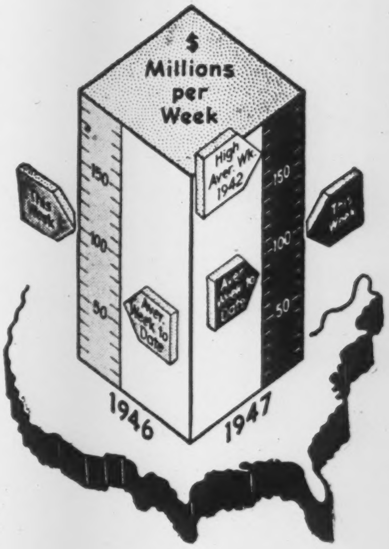
Henry Ericsson dies, was Chicago building leader

Henry Ericsson, 85, Chicago building contractor and founder of the firm that bears his name, died Feb. 19 at Miami, Fla., where he had been vacationing.

A native of Torp, Sweden, Mr. Ericsson came to the United States at the age of 20, and in 1883 founded the Henry Ericsson company which played a major part in the transformation of Chicago into a modern metropolis. His company built the Monon Building in 1889—the first 14-story structure in Chicago; and a year later it built the Manhattan Building, a 16-story office building. Many other structures, including the Aluminum Company of America's sheet rolling mill at LaGrange, Ill., and the U. S. Postoffice at Columbus, Ohio, were erected by the company.

Mr. Ericsson served as Chicago's building commissioner from 1911 to 1915, and was a former president of the Building Construction Employers Association.

CONSTRUCTION ACTIVITY



As Reported this week to . . .
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of Feb. 27 1947	Cumulative 1947 (9 wks.)	Cumulative 1946 (9 wks.)
Federal	$4,350	$71,945	$66,646
State & Mun.	42,213	207,034	123,563
Total Public.	$46,563	$278,979	$190,209
Total Private	45,141	508,482	406,093
U. S. Total..	**$91,704**	**$787,461**	**$596,302**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1947 (9 wks.)	Cumulative 1946 (9 wks.)
Waterworks ...	$1,943	$19,068	$9,602
Sewerage	2,012	15,956	5,660
Bridges	3,778	22,626	16,279
Highways	12,845	75,884	64,908
Earthwork, Waterways	2,037	21,913	36,909
Buildings, Public	13,506	81,897	44,916
Industrial ...	10,822	134,909	180,577
Commercial ..	33,341	325,926	195,380
Unclassified ...	11,420	89,282	42,071

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1947 (9 wks.)	Cumulative 1946 (9 wks.)
NON-FEDERAL ...	$183,005	$143,333
Corporate Securities	17,845	63,204
State and Municipal	165,160	80,129
FEDERAL	....	158,320
Total Capital	**$183,005**	**$301,653**

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost..	Feb. '47	390.76	187.84
Building Cost.....	Feb. '47	297.38	160.75
Volume	Jan. '47	195	86

CONSTRUCTION REPORTS

Bids Asked — Low Bidders — Contracts Awarded

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.

ELSIE EAVES, Manager *J. A. MAHONEY, Reports* *J. V. McEWEN, M. R. ROESSLER, Statistics*

WATER SUPPLY

Construction Reports received since this section went to press will be found in Last Minute Construction Reports.

BIDS ASKED

Bids Asked March 4

O., Kent—City, M. J. Billings, service dir., 10 in. water line on Kent State University Campus, and 1,000 gal. water pump.

O., Toledo—City, J. W. Jewhurst, serv. dir., approx. 8,600 lin. ft. 36 in. watermains together with appurtenance fittings for rein.-con. pipe, steel pipe and cement lining, for Contr. 73-A, Bancroft St., Crosstown Main. $130,000. G. Laska, Cherry St., City Water Dpt. engr.

Bids Asked March 5

Ala., Vernon—Town, c/o mayor, Vernon, water filtration plant addn. $25,000. Polglaze & Basenburg, 1001 Empire Bldg., Birmingham, engrs.

Bids Asked March 6

Md., Baltimore—Bd. Awards, City Registers Office, City Hall, pressure water tunnel, Liberty Heights, Montebello. Bid date change. CD 1/9—ENR 1/16.

Bids Asked March 10

Wash., Pullman—Washington State College, Pullman, 8,000 ft. 8- to 12-in. c.i. distr. sys., 2 m.g. reservoir, 100,000 gal. tower tank and well house. $200,000. Stevens & Koon, Spalding Bldg., Portland, Ore., engrs. CD 6/13—ENR 6/27.

Sask., Melfort—E. D. Carwardine, town clk., watermains, hydrants, valves, etc. for municipality. $35,000. Plans deposit $10. Underwood & McLellan, 502 Grain Bldg., Saskatoon, engrs.

Bids Asked March 11

Alta., Vegreville—J. Fitzallen, municipality, clk., watermains, services. $40,000. Plans deposit $10. Underwood & McLellan, 502 Grain Bldg., Saskatoon, Sask., engrs.

Bids Asked March 12

Conn., Groton—Boro, water supply main. $200,000. Plans deposit $10. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs.

Bids Asked

Pa., Ridgeway — Boro, filtration plant, 1 story, 30x60 ft. brick bldg., incl. filter structures, filter plant bldg. and outside piping, furnishing, installing filter equip. and piping. $89,452. Richard Harman, 222 N. 3 St., Harrisburg, consult. engr. CD 6/19—ENR 6/27.

SOON LETS CONTRACT

N. J., Lambertville—Lambertville Water Co., soon lets contract filter plant. $90,000. I. M. Glace & Assoc., 22 S. 22 St., Harrisburg, Pa., engrs.

LOW BIDDERS

Ark., Hot Springs — City, water treatment plant, from Tri-States Constr. Co., Reigler Bldg., Little Rock. **$116,594.** CD 1/16—ENR 1/23.

†D. C., Wash.—U. S. Eng., First and Douglas Sts. N.W., Zone 25, postponed bids to have been opened Feb. 18, 16 in. pipeline, Hobart St. to Court No. 2, Washington Aqueduct, McMillan Filtration Plant, Serial 49-080-47-19 (3) C. CD 2/6—ENR 2/13.

Ill., Alton — Illinois Div. Architecture & Eng., Armory Bldg., Springfield, Feb. 11, elevated water tank, Proposal 1, from Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago, **$49,585**; repairing WW, from Caldwell Eng. Co., 805 W. College St., Jacksonville, **$5,267**, for Illinois Div. P. Welfare, Capitol Bldg., Springfield. CD 2/5, under Ill., Springfield.

Ill., Elgin — Illinois Div. Architecture & Eng., Armory Bldg., Springfield, Feb. 11, well, for Illinois Dpt., P. Welfare, Capitol Bldg., Springfield, Proposal 1, from F. B. Geiger & Co., 37 W. Van Buren St., Chicago. **$28,500.** CD 2/5, under Ill., Springfield.

Ill., Rockford—City, City Hall, rejected bids Feb. 20, well, 17 Ave. and 18 St. L.B. $38,316.

N. D., Minot — City, Feb. 3, water reservoir, from Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago, Ill. **$47,468.** Est. $49,000. CD 1/23—ENR 1/30.

Tenn., Dover — Dover Utilities Dist., Dover, WW imprvs., from Bush Building Co., 805 8 Ave. N., Nashville. Est. over **$22,500.** CD 2/7—ENR 2/13.

Wash., Bellevue — Water Dist. 68, c/o Parker & Hill, engrs., 2021 Smith Tower, Seattle, Zone 4, 500,000 gal. rein.-con. reservoir and 2 pump. stations for water sys., from Hall Atwater Co., 4th and Cherry Bldg., Seattle, Zone 4. **$59,937.** CD 2/4—ENR 2/6.

CONTRACTS AWARDED

Ark., Mena — City, water treatment plant, to Midwest Contg. Co., 403 S. Haskell St., Dallas, Tex. **$29,437.** Bids 2/11. CD 2/10—ENR 2/13.

Mass., Boston—City, City Hall Annex, earth excav., refilling for Water Div., to install, regulate or repair water structures, in City Proper, South Boston, East Boston, Charlestown and Roxbury Dist., to Construction Units, 294 Washington St., Boston, **$30,275;** excavating, refilling for Water Dpt., also installing wooden boxes and post hydrants in Brighton Dist., to Joseph Capone, 380 Beech St., **$9,758.** Awarded 2/15.

Mich., Port Huron — City, City Hall, installing WW imprvs., 2 pump. units, to Worthington Pump & Machinery Co., 2824 E. Grand Blvd., Detroit, **$13,950*****1 variable speed motor, to Allis Chalmers Mfg. Co. 1800 Fisher Bldg., Detroit, **$6,006*****electrical switch gear and equip., to General Electric Co., 700 Antoinette St., Detroit, **$30,911.** Grand total $50,867. Bids 10/21. CD 10/14.

Minn., Brainerd — City, Water & Light Bd., A. H. Thon, secy., furnishing, installing, alterations and addns. to water treatment plant, to A. G. Peterson, Brainerd. **$96,489.** Bids 2/6. CD 1/29.

Mo., Weston—City, WW imprvs., to General Eng. Co., 1145 Woodward St., Topeka, Kan. Est. **$40,000.** Shockley Eng. Co., Reliance Bldg., Kansas City, Mo., engr.

Tex., Burnet — City, G. G. Medders, mayor, water sys. imprvs., incl. addnl. c.i. mains, rein.-con. reservoir, pump. unit, to Roy Mitchell, 1423 Woodrow St., Shreveport, La. **$37,920.** Bids about 1/1. CD 12/16—ENR 12/19.

T. H. Honolulu—City, 4,000 ft. water tunnel at Waianae, Oahu, to Hawaiian Dredging Co., Honolulu. **$431,559.** CD 10/24/45—ENR 11/15/45.

Alta., Edmonton—Municipality, constructing water tank, to Horton Steel Works Ltd., Sarnia, Ont. Est. **$60,000.** A. W. Haddow, City Hall, engr.

Ont., Sioux Lookout—Town, A. Wrene, clk., WW and sewerage sys., to Malvern Constr. Co. Ltd., 648 Danforth Ave., Toronto, approx. **$300,000.** Proctor, Redfern & Loughlin, 36 Toronto St., Toronto, engrs.

SEWERS, WASTE DISPOSAL

Construction Reports received since this section went to press will be found in Last Minute Construction Reports.

BIDS ASKED

Bids Asked March 5

Mass., Newton—City, City Hall, sanitary sewer in Kirkstall Rd. from Morse to beyond Upland Rds. $40,000. Plans deposit $10.

Bids Asked March 10

Conn., Hamden—Town Bd. Sewer Comrs., Town Hall, sewage pumping equip. incl. 500 g.p.m. pump, 1,060 ft. 8 in. c.i. force main. F. Walden Wright, Town Hall, engr.

Ont., Sarnia—Miss M. D. Stewart, city clk., sewers in Bright, Russell and East Sts. Approx. $165,000. Gore & Storrie, 1130 Bay St., Toronto, engrs. C. T. Laidlaw, city engr. CD 10/2—ENR 10/17.

Sask., Melfort—E. D. Carwardine, town clk., sewers, manholes, etc., for municipality. $45,000. Plans deposit $10. Underwood & McLellan, 502 Grain Bldg., Saskatoon, engrs.

Bids Asked March 11

†Ark., North Little Rock—Veterans Admin., 8 and Olive Sts., St. Louis 1, Mo., replacing main interceptor sanitary sewer for Veterans Admin. Hospital, incl. 3,500 ft. 8 and 12 in. c.i. and vitr. clay pipe sewer with manholes, etc.

Wash., Tonasket—City, City Hall, 19,000 ft. 6- to 10-in. vitr. clay sewers, treatment plant. $90,000. Plans deposit $25. DeWitt C. Griffin & Assoc., Lloyd Bldg., Seattle, 1, engrs. CD 1/16—ENR 2/7.

Bids Asked March 12

Calif., San Francisco—Dpt. P. Wks., City Hall, Vicente Street outfall sewer. Over $40,000. Plans deposit $10. R. Wadsworth, City Hall, San Francisco, city engr.

Pa., Embreeville—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, general contract and electrical work for sewage disposal plant at Embreeville State Hospital. $100,000. Plans deposit $5 for general and $2 for electrical contracts. Extended date. John H. Wickersham, 14 S. Duke St., Lancaster, engr. CD 2/14—ENR 2/20.

Bids Asked March 18

Tex., Mt. Pleasant — City, Ben Patrick, mayor, sewage treatment plant imprvs. $60,000. Plans deposit $25. Extended date. Koch & Fowler, Great Natl. Life Bldg., Dallas, engrs. CD 2/17—ENR 2/20.

Bids Asked March 20

Kan., Greenleaf—City, at office H. M. Ryland, clk., sanitary sewerage sys., and sewage disposal works. Plans deposit $10. Wilson & Co., 223 N. Santa Fe St.. Salina, engrs.

LOW BIDDERS

Calif., Fresno—City, City Hall, Feb. 13, sanitary sewers in McKinley Park, Lamona Land, Lamona Land Addn., etc., from A. E. Downer Co., 305 E. Weber Ave., Stockton. **$99,803.**

Calif., La Mesa—City, City Hall, Feb. 11, trunk sewer line and 2 pumping plants, from M. U. Hutchison, 8949 Alpine St., La Mesa, (alt.) **$79,800.** Est. $75,000. CD 1/24—ENR 1/30.

N. Y., Jamaica—President Queens Boro, 120-55 Queens Blvd., Kew Gardens, Zone 51, Feb. 14, temporary automatic electric pumping station, 114 St., from Kennedy & Smith, Inc., 131-20 41 Ave., Flushing. **$288,870.** CD 2/4—ENR 2/6.

Tex., Sherman—City, Feb. 12, imprv. sewage disposal plant, from L. W. Wientzel, Box 812. **$78,431.** CD 1/21—ENR 1/23.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co. Sanitation Dist. 2, 1206 S. Maple St., installing 13,313 ft. 63 in. cent. rein.-con. sewer pipe from Atlantic and Hunsaker, north of Long Beach to Main St., in Hollydale South Gate Dist., force account. Approx. **$500,000.** CD 1/19—ENR 11/21, under LB.

PROJECTS COVERED

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks $22,500; other public works $40,000; industrial buildings $55,000; other buildings $205,000.

Classes of Construction

(Name in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings
Unclassified

Stages Reported

PROPOSED WORK: Including appointment of engineers or architects.

BIDS ASKED (new announcements only). For full calendar, see also preceding issues of ENR.;

LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Symbols and Abbreviations Include:

†	Federal Government
★	Project of $1,000,000 or over.
ENR	Engineering News-Record
CD	Engineering News-Record Construction Daily